NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN FOR TUVALU 2018 - 2022

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FOREWORD

The Government of Tuvalu has recognised the importance of Biodiversity to the livelihood of its people. With this recognition, the government through the Department of Environment committed to develop this plan as a guide to the department and its stakeholders in addressing various environmental issues that affected biodiversity. The development of this plan is an obligation of the Government to adhere to as stipulated under the UNCBD Article 6 that "General Measures for Conservation and Sustainable Use" requires party countries to develop a national biodiversity strategic action plan.
Tuvalu managed to submit its first NBSAP to CBD that cover the period for 2012 – 2016 in 2014.

This is the second NBSAP for Tuvalu and it is covering the period from 2018 – 2022. The Tuvalu NBSAP was developed in consultation with the communities from the outer islands and on Funafuti, NGOs and governmental departments. The plan has set out in a way that recognizes national, regional and international plans. It recognizes the Te Kete, national strategy for sustainable development. The Te Kete, emphasize the enforcement of environment Impact assessment and social impact assessment in any development in Tuvalu. Thus, minimize the impact of developments on a particular environment.

Tuvalu has been done a lot in the past to achieve what has been set out in NBSAP I. The Tuvalu Sixth National Report to the CBD rated most targets in NBSAP I to On Track to Achieve. This means that Tuvalu is doing well in most of its target. Although there are gaps exist, but this plan has provided an opportunity for the Department of Environment to address these gaps. The Ministry will continue to maintain it working relationship with other government ministries and the public in order to achieve targets that have been defined in this plan.

As the concerned Minister for Environment and the Government of Tuvalu, I am delighted to present this plan. It provides a clear set of strategies for the protection and conserving of biodiversity in Tuvalu. Lastly but not the least, the future of Tuvalu biodiversity depends on our action today.

Fafetai Lasi

Hon. Ampelosa Tehulu
Minister for Public Utilities, Infrastructure, Environment, Labour, Meteorology & Disaster

1. INTRODUCTION

1.1 Introduction to Tuvalu

Tuvalu, formerly the Ellice Islands, is a group of atolls lying south of the equator in the western Pacific Ocean, south of Kiribati and north of Fiji. Tuvalu is the fourth smallest nation in the world by area with a landmass of only 25.9km2 (although the atolls extend in a chain 595 km long) spread across the central Pacific from 6° to 10° south, and represents the southern-most islands of the Gilbert-Ellice chain.

The islands consist of 5 coralline atolls (Nanumea, Nui, Nukufetau, Funafuti, Nukulaelae), and 3 table reef islands (Nanumaga, Niutao, Niulakita) which are more single islets composed of sand and coral materials thrown up by wind and wave action. There is one composite (coralline atoll/ table reef) island (Vaitupu) which has the characters of both an atoll and a reef island. Topographically, all Tuvalu's islands seldom rise any more than four metres above sea level. Soils are generally of poor quality, supporting a limited variety of flora. The country's Exclusive Economic Zone (EEZ) covers 900,000 km2 and is rich in fish stocks.

Tuvalu is one of the most vulnerable countries in the world to climate change and rising sea levels. The atoll of Fogafale, Funafuti, where nearly half of the country's population is concentrated, is on average less than 100 metres wide, making it extremely susceptible.

Tuvalu has a hot, humid tropical maritime climate. The mean annual temperature is 30°C, with little seasonal variation, though the months from March to October tend to be cooler. The wettest season occurs between November and February while the dry season can experience droughts of up to three months in duration, especially in the northernmost islands. The average annual rainfall is 3,535 mm although rainfall can exceed 4,000 mm per annum at times. Dry years in Tuvalu are associated with a positive Southern Oscillation Index (the cold phase of ENSO). Easterly trade winds prevail for much of the year except in the wet season when winds blow from west or north. Tropical cyclones mainly develop in the Tuvalu area and move to higher latitudes with a few hitting the islands in the warm, rather than the cold phase of ENSO. Severe cyclones have struck in 1894, 1972 and 1990 with the most recent damaging one Pam occurring in 2015. It caused damage to houses, crops and infrastructure on the outer islands with Nanumea, Nanumaga and Niutao badly affected by flooding as the result of storm surges. On Nui the surges contaminated the water supplies and damaged septic tanks and grave sites, and the central islands of Vaitupu and Nukufetau also experienced flooding. Vasafua islet, part of the Funafuti Conservation Area, had its vegetation washed away leaving a sand bar.

Tuvalu's population was estimated as 10,645 in November 2017, excluding ex-patriot communities mainly in Australia, New Zealand and Kiribati (MFPEI, 2017). An upward trend at the start of the decade has been reversed slightly more recently with a decline of 137 (1.3%) since 2012 based on people moving overseas. Nearly half of the population is located on Fongafale motu

(the main settlement area) on Funafuti atoll. It has a land area of about 2.8 sq. km with an estimated population of 6,320 in 2017, giving a population density of 2,257 persons/ sq. km.

A passenger and cargo vessel, based at Funafuti, which occasionally calls at Suva, Fiji, serves the islands. Ships from Fiji, Australia and New Zealand call at Funafuti. The only airfield is on Funafuti, at the eastern tip of the island.

The in-migration from outer islands and socio-economic changes has led to changes in the traditional communal order, creating a more individualistic society with issues with climate, pollution, ecosystem degradation and concerns over water, food and nutrition security (Makolo et al. 2017). There is increasing recognition that sustainable livelihoods and protection from the threats of climate change and natural disasters are closely linked to healthy terrestrial and coastal ecosystems (Kaupule 2016).

Dietary patterns have also shifted with half the people on Funafuti eating imported foods that are relatively nutrient-poor compared to the items in the traditional low-fat diet (McCubbin et al. 2017). So that food security initiatives, such as increasing the growing of local agricultural crops, conserving local agri-biodiversity, and ensuring the sustainable of local fisheries, are more about ensuring food of sufficient nutritional and cultural value rather than food availability.

About 95% of the land is customarily land owned by individuals, with small areas of Crown or communally-owned land on some islands. This system leads to land fragmentation, multiple ownership and boundary disputes which make it difficult for coordinated land planning and management, e.g. for habitat conservation.

What is Biodiversity?

Biodiversity, or biological diversity, is used to describe the variety and number of all living organisms on earth. This variety includes all plants, animals and micro-organisms, the genes they contain and the ecosystems they form.

The NBSAP places priority on the conservation of native species and ecosystems, i.e., those occurring naturally in Tuvalu. It also places importance on the variety of species introduced by people to the country that are used productively, or agro-biodiversity which includes crops, livestock and species in aquaculture.

1.2 Introduction to Tuvalu's Biodiversity

Indigenous plants are rare, partly because of habitat modifications such as the extensive planting of coconuts and other food plants by early settlers. 362 species have been recorded, of which only about 59 are indigenous species and the rest are introduced (Thaman et al. 2018a). Most are ornamentals and shrubs. There are no indigenous land mammals, amphibians or freshwater fishes. Twenty-eight species of indigenous birds are known, approximately 20 species being sea birds, a few of which are migratory. There are also insects, land crabs and a few species of lizards of which one, the Tuvalu forest gecko (Lepidodactylus tepukapili, found on Tepuka Islet, Funafuti is Tuvalu's only endemic vertebrate.

The marine environment is comprised of six major ecosystem types (oceanic, outer reef, lagoonal, back reef, lagoon floor, patch reefs and natural channels between the ocean and lagoon). These ecosystems produce the sediment required for island building and maintenance and support communities of corals, other invertebrates, algae, plankton, fish and marine mammals and reptiles. Over 600 species of fish have been recorded.

A preliminary assessment of Tuvaluan plants, fishes, birds and insects was carried out in 1998 (Seluka et al 1998) and comprehensive marine surveys carried out at several atolls since 2010 (Job & Ceccarelli 2012, Alefaio et al. 2016). Birds have been surveyed at Funafuti Conservation Area (Watling 1998) but not nationally. A compilation of the plants of Tuvalu illustrated with photos was recently published (Thaman et al. 2012).

1.3 Importance of biodiversity to Tuvalu

Tuvaluans have developed an intimate knowledge of plants and marine resources and their use. Most Tuvaluans practice subsistence fishing, farming and the harvest of plant products depending on fish, shellfish and other sea foods, coconut, breadfruit, bananas, taro, pandanus, a limited number of other crops, pigs, chickens, seabirds and some wild plants, such as the bird's nest fern (laukatafa). Plants and a limited range of marine organisms are also the main traditional sources of medicines, fuel, construction and boatbuilding materials, handicrafts, garlands and perfumes (Thaman et al. 2012).

The marine environment provides the main local source of protein and Tuvaluans know a great deal about marine species, habitats and life cycles, such as where and when to fish and what baits to use. Fishing is carried out by men but women may also, from time to time, be involved in inshore and shallow water fishing. Commercial fishing operations have increased on Funafuti in recent years and there are now about 30 commercial fishermen on Funafuti Island using more modern methods and gear.

Offshore, deep-water fisheries in Tuvalu's large EEZ make a vital contribution to the country's economy, along with remittances from Tuvaluans working overseas, official development aid and income from the Tuvalu Trust Fund, largely through licensing agreements with foreign fishing nations. A combined revenue of US$32,296,850.00 in 2021 for the offshore foreign-based fishery of Tuvalu. This is largely the selling of fishing days that is accounted for 89% of the total revenue, fishing licenses 9% and transhipment of at least 2%. A huge decline of the Tuvalu fishery revenue in 2021 as compare to 2014 which estimated to be $160, 981,136.00 (AUD$). This was caused by impact of COVID-19 to fishery activities in the country.

Harvest Sector	Volume (mt)-2014	Value (AUD$)-2014	Volume (mt)-2021	Value (AUD$) -2021
Offshore Foreign-based	96,898	160,981,136	57,748	32,296,850

Table 1: Estimated volumes and value of total annual fisheries catches harvest in Tuvalu in 2014 & 2021

Improved negotiations by countries in the region working together have seen the income from fisheries licenses rise significantly in recent years accounting for 49% of all income at AUD$23.7 million (September 2015 year to date) compared to less than AUD 6.6 million, or about 16% of total revenue in September 2014 (Fisheries Department data). This income from fisheries licenses has been decrease by almost 83% (AU$4.1 million) in 2021 due to impact of COVID to offshore fishery activities.

1.4 Threats to Tuvalu's Biodiversity

1.4.1 Climate change

Human-induced climate change poses several threats to the country's species and ecosystems as below:

Sea-level rise

The major impacts of sea level rise are increased risks of inundation and coastal flooding, erosion, salt-water intrusion into underground aquifers, coastal vegetation and taro pits, and changes in sediment deposition patterns. Vegetation and species living in the coastal zone face particular threat from periods of extreme wave activity and storm surges that can destroy native habitats and the sites used by ground-nesting birds such as terns. The frequency and intensity of flooding are increasing with inundation of larger land areas. Funafuti with a mean elevation of approximately 1.5m above mean sea level is particularly vulnerable to storm surges and tidal swells. The islands' vulnerability has increased through actions like the reduction in tree cover and damage to reefs.

More severe weather events

An increased frequency of severe events, e.g., damaging cyclones and droughts, is expected. The recent TC Pam has been devastating and a lot of Tuvaluan lives were impacted. Tuvalu may be vulnerable to more severe droughts, particularly in the northern islands as they are more susceptible to variations in rainfall. Droughts in the northern atolls in 2011-2012 resulted in a serious lack of water and significant losses of vegetable and fruit crops. A drop in rainfall could severely affect Tuvalu's access to freshwater, impacting seriously on drinking water capacity and Tuvalu's agricultural and livestock production.

Increases in ocean surface and island air temperatures

Coral bleaching is a particular threat to reefs associated with higher sea temperatures and recent events are reported on by the Ridge to Reef Project and the Corals for Conservation Project. Tuvalu had already been placed under a bleaching watch by NOAA scientists, with hot water and associated bleaching expected to drift over Tuvalu. There has been few coral bleaching and brightening in the project site that the project team had visited during the scoping phase. Much of Tuvalu now shows an alert level, from Funafuti and all reefs north, with a 60% chance of major bleaching (Ridge to Reef 2018). The project has done some work in rescuing the corals already identified as bleaching resistant but threatened by their presence in the extreme shallows within the shallow southern lagoon.

Acidification of the ocean

Increases in ocean pH derived from increased absorption of CO2 make it more difficult for corals and shellfish to absorb the calcium carbonate they need to build their skeletons, threatening reefs and food supplies. Water testing conducted by the Regional Ridge to Reef Project and Fisheries Department provides local data on this

1.4.2 Invasive species (IS)

Invasive species can impact on biodiversity, on the economy (through impacts on agriculture and fisheries), and on human health and well-being. Tuvalu faces problems from IS that are already established in the country and threats from many more species that could arrive unless border control and surveillance is strengthened.

IS present include the following:

- Four rat (Rattus) species are common on all islands and are major threats to nesting birds, reptiles, invertebrates and poultry and food crops.

- Weeds – Leucaena leucocephala, Coccinia grandis, Sphagneticola trilobata, Mikania micrantha, Paspalam vaginatum, Ipomea micrantha, Ivy gourd (Coccinia grandis) and Taro vine are some of the most persistent and widespread species that have been approved by TAG and the Agriculture Department for better management.
- Insect pests of agricultural crops – three major pests are the coconut scale insect (Aspidiotus destructor) which damages food crops (e.g. breadfruit and sweet potatoes as well as coconuts); the termite (Neotermes rainbowi) which can cause coconut palms to fall; and the pink mealy bug (Macinellicocus hirsutus) which feeds on banana and pawpaw.
- Mosquitoes that are disease vectors - the mosquitoes Aedes aegypti, Aedes albopictus and A. polynesiensis (the vectors for dengue fever and lymphatic filariasis respectively) are present.
- Crown of Thorns starfish (Acanthaster planci) – it is suggested that this is a recent introduction to some of the islands via ballast water, but recent surveys showed it to be rare and not currently a major threat to coral reefs.
- Cane toad (Rhinella marina) - this is toxic to predators and a particular threat to dogs.

Many of the issues associated with alien species in the Pacific, noted at a workshop in Nadi, Fiji in 1999, apply to Tuvalu:

- Lack of information on the basic biology of many invasive species
- Lack of monitoring of high-risk areas
- Lack of understanding of the major threats posed by pests
- Lack of personnel and infrastructure
- Absence of, or inadequate protocols, such as those to warn of threats, predict invasiveness of new species at the border, maintain quarantine procedures and set priorities for management
- Absence of, or inadequate legislation and enforcement
- Inadequate funding.

1.4.3 Over-harvesting

Over-harvesting was identified by communities on Funafuti (Thaman et al. 2018a) and Outer Islands (Thaman et al. 2018a) as a key driver for the loss of a wide range of marine organisms, led partly by commercialisation of some marine resources. There is specific evidence from surveys of overharvesting of several groups including sea cucumbers (beche-de-mer), giant clams, coastal fisheries and nesting seabirds. Over-harvesting is linked to changes in population, particularly the shift of people from other islands to Funafuti, changed consumption patterns, and the availability of modern harvesting methods – e.g., boats with outboard motors and firearms in relation to seabirds.

1.4.4 Habitat loss & deterioration

Incursion of sea water during high tides has resulted in the loss of c.8ha of coconuts on Nanumea, Nanumaga and Niutao in recent years and some remaining stands are old and of reduced productivity – e.g., on Nanumea and Nukufetau. The nearshore coral reef on Fongafale atoll has largely been lost due to siltation. Degradation of reefs and lagoons has also occurred, including the impacts of marine pollution (see 1.4.6) (Thaman et al. 2018b).

1.4.5 Offshore fisheries management

Past management of the offshore fishery has been fraught with problems associated with weak management control and the migratory nature of the main species, tuna. Many distant water fishing fleets, both licensed and unlicensed, have exploited the lack of enforcement capabilities in the region and engaged in illegal, unreported and unregulated fishing, including fishing without licenses, falsely reporting catches, illegally trans-shipping catches and avoiding vessel monitoring systems. Tuvalu has one patrol boat and a monthly air patrol is carried out by the Royal New Zealand Air Force. Managing migratory fish stocks with incomplete catch and stock data is challenging and can threaten targeted and non-target species. This challenge has been extremely unmanageable when there are no observers on fishing vessels during the pandemic. No boarding and limited aerial and surface surveillance in 2021 when the Te Mataili was inactive for the whole year. The Tuvalu Fisheries Department introduce a new tool for surveillance in order to provide them with some information and as a result the department manage to produce some interesting result.

1.4.6 Pollution

Waste management has proved challenging given the small land area and high densities of people, resulting in leaching from landfills, and groundwater severely compromised by inadequate sanitation systems on Funafuti. Lagoons and fringing reefs are also threatened by coastal run-off including sewage from leakage from septic tanks.

1.5 Barriers to conservation in Tuvalu

There are a range of general barriers that make the conservation of biodiversity challenging on Tuvalu which need to be addressed in this strategy as follows:

- Lack of legal protection and institutional weakness
- Limited financial resources
- Remoteness of outer atolls
- Limited technical and management capacity
- Limited biodiversity awareness
- Lack of legislation and policies
- Insufficient mainstreaming
- Insufficient baseline data

1.6 Current projects

This section outlines several major projects that are currently addressing the conservation of biodiversity.

Implementing 'Ridge to Reef' approach to protect biodiversity and ecosystem functions in Tuvalu (Tuvalu R2R Project)

The goal of the R2R project is "to preserve ecosystem services, sustain livelihoods and improve resilience in Tuvalu using a 'ridge-to-reef' approach". The project focuses on:

- enhancing and strengthening conservation and protected areas
- rehabilitating degraded coastal and inland forests and landscapes and supporting the delivery of integrated water resource management (IWRM) and integrated coastal management (ICM) at a national scale whilst piloting hands-on approaches at the island scale (on three selected pilot islands)
- enhancing governance and institutional capacities at the national, island, and community levels for enhanced inland and coastal natural resource management
- improving data and information systems that would enable improved evidence-based planning, decision-making, and management of natural resources.

It has recently carried out BIORAPs (Rapid Biodiversity Assessments) as community-based survey conducted using a detailed questionnaire in Funafuti (Thaman et al, 2018a) and outer islands (Thaman et al, 2018b). Communities in Funafuti mentioned over 1000 species known to them and considered 63% of these to be threatened and 27% rare or extinct there. Those on outer islands identified well over 1500 species of which 74% were considered threatened.

Securing Marine-based Coastal Livelihoods from Climate Change and Climate-Induced Disasters' (NAPA II)

NAPA II has the goal of increasing the resilience of outer island communities to future climate change risks of declining marine resources and intensifying hazards. It aims to enhance the resilience of marine-based livelihoods through improve reef health and increase fish stocks in the outer islands, e.g., through installation of Fish Aggregate Devices. NAPA II will work closely with the R2R project particularly in establishing indicators for monitoring marine conservation areas and building capacity of island communities to manage these areas.

The Tuvalu Marine Life Project (2012) by NGO, Alofa Tuvalu, has completed surveys and data collection that documents 1400 species of marine life around the islands.

Conservation Area establishment

Tuvalu has established eleven conservation areas (CA), two on Vaitupu and Nanumaga and one on the other seven islands. Only one has been established under formal legislation and the rest have been established by local communities and managed by traditional systems. The Funafuti Marine Conservation Area (FMCA) was established with the assistance of the South Pacific Biodiversity Conservation Programme (SPBCP - a GEF funded initiative), AusAID and SPREP. The CA is managed by the Kaupule, the executive arm of the atoll's traditional decision-making assembly, the Falekaupule.

Regional R2R Project

This has been established to integrate and demonstrate climate resilient R2R in a holistic manner by building on the implementation of national Integrated Water Resources Management (IWRM) plans in pilot sites in each country linked to enhanced Integrated Catchment Management. In Tuvalu, the project focusses on:

- Demonstration of innovative approaches to pig waste management on Funafuti Atoll, Tuvalu
- Development and operation of a targeted science programme to: improve the operation of onsite waste management systems; and, to identify causal links between land-based contaminants and the degradation of lagoon health
- National and community capacity building and awareness activities in support of the enhance uptake of sustainable human and pig waste management systems on Funafuti and outer atolls and islets.

Tuvalu Coastal Adaptation Project (TCAP)

The Government of Tuvalu is implementing measures to reduce the impacts of climate-induced sea level rise and intensifying storm events on key infrastructure. Building on existing initiatives, and using a range of measures for coastal protection - including eco-system initiatives, beach nourishment, concrete and rock revetments, and sea walls - the project focuses on building coastal resilience in three of Tuvalu's nine inhabited islands.

Resilience Recovery Rapid Readiness Support in Tuvalu

Climate change is a fundamental cross-cutting issue that undermines Tuvalu socio-economic development efforts. Tuvalu's climate change priorities are articulated in the recently approved Te Kete Sustainable Development Strategy 2021-2030, national climate change policy, sectoral policies as well as in legislation such as the Tuvalu Climate Change and Disaster Survival Fund Act and Regulations. As indicated in the NDC, Tuvalu commits to a reduction of emissions of greenhouse gases from electricity by 100% by 2025. Emissions will be reduced from all other key sectors including Agriculture and Waste, conditional upon the necessary technology and finance. An updated climate change strategy is currently being prepared.

Objectives: 1. Fiscal revenue and impacts on Tuvalu capacity to implement national climate policies and international commitments 2. Food security and development of national agriculture production 3. Fishery and tourism 4. Education 5. Energy and water 6. Infrastructure 7. Disaster Preparedness and Management and resiliency of the health system

Development of Tuvalu's National Adaptation Planning (NAP) to advance medium and long-term adaptation planning.

Topography, size, geographical remoteness and access to resources. Despite these challenges, it has become a leading voice for enhanced climate mitigation regionally and globally. Tuvalu is now developing a national adaptation planning process (and NAP) that will form a sustainable platform for future adaptation investments.

Pacific Adaptation to Climate Change and Resilience Building

Pacific Adaptation 1 to Climate Change and Resilience Building (PACRES) aims to ensure better regional and national adaptation and mitigation responses to climate change challenges facing Pacific ACP countries. It is being implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP), the Pacific Islands Forum Secretariat, the Pacific Community and the University of the South Pacific. PACRES is supporting regional and national climate change portals to increase access to and reach of climate change and disaster resilience information. This includes contributing to ongoing maintenance and support of regional and national knowledge management portals, which are critical to their long-term sustainability.

Integrated Water Resource Management

The Tuvalu Integrated Water Resource Management Project focuses on the atolls of Funafui, Niutao, Nanumea and Nanumaga working on developing drought management plans, creating water and sanitation plan, and collecting data and producing a toll to enable accurate forecasting of water shortages and drought information.

Managing Coastal Aquifers Project (MCAP)

These coastal aquifers are fragile thin freshwater lenses that float on the underlying denser seawater and are reliant on rainfall for recharge. These coastal aquifers are at higher risk of impact to water quality deterioration from threats including saltwater contamination from sea level rise, over abstraction, wave overtopping, loss of aquifer area through coastal erosion, and other impacts on water quality from inappropriate land-use activities. Climate change exacerbates these long-running threats to coastal aquifers through increased climate variability and climate extremes. The fragility of coastal fresh groundwater systems necessitates careful management and protection to ensure their long-term integrity and their role in climate change adaptation strategies and improved water security. The project aims at improving the understanding, use, management and protection of coastal aquifers towards enhanced water security, including in the context of a changing climate. More specifically it aims at 1) identifying the extent, threats and the development potential of groundwater resources, 2) increasing awareness of groundwater as a water security supply source, 3) providing options for improved access to groundwater and 4) and improving aquifer protection and management, within Pacific Small Island Developing States.

Tuvalu Third National Communication Project

Preparation of Third National Communication (TNC) under the UNFCCC In relation to many SIDS, Tuvalu is extremely vulnerable to climate change and its impacts. Given that communities are very much aware of global warming and its damaging effects, they still continue to fight for their survival and future better livelihood. In every Conference of the Parties (COPs) and other Climate Change dialogues, Tuvalu continuously expressed a common phrase that “if you save Tuvalu, you save the world”. This is the Prime Minister’s impassioned phrasing challenging the parties to meet their obligations under the UNFCCC and its protocols. Ratifying the UNFCCC and its protocols including the Paris Agreement was part of Tuvalu obligation towards addressing climate change impacts. Generally, Tuvalu signed and ratified the United Nation Framework Convention on Climate Change (UNFCCC) on 8th June,1992 and has also ratified the Kyoto Protocol and the Paris Agreement. Having identifying detrimental environmental concerns such as coastal erosion, salt water intrusion and drought, it built efforts to develop its National Environmental Management Strategy (NEMS) in 1997, the National Adaptation Program of Action (NAPA) in 2007 and other new climate policies and strategies to ensure policy actions are effectively in place as well environmental and socioeconomic safeguards including gender are respectfully realized and implemented.

Global Climate Change Alliance Plus Scaling Up Pacific Adaptation (GCCA+ SUPA)

The proposed Action takes place within the framework of an existing Financing Agreement between the Pacific Islands Forum Secretariat (PIFS) and the European Union (EU) for the implementation of the Global Climate Change Alliance Plus - Scaling-up Pacific Adaptation (GCCA+ SUPA) Programme. The Action contributes to the implementation of the regional component of this Programme. This action will be implemented in indirect management with the Pacific Community (SPC) and the Secretariat of the Pacific Regional Environment Programme (SPREP), who will enter into a Co-Delegation Agreement with SPC as lead and coordinating organisation. A separate Grant Agreement for Euros 2.1 million will be signed between the European Commission and the University of the South Pacific (USP). Within a framework of close collaboration and integration, each of the three regional implementing organizations has responsibility for delivery of a specific output as further detailed below. The Overall Objective is to enhance climate change adaptation and resilience within ten Pacific Island countries. The Specific

Objective is to strengthen the implementation of sector-based, but integrated, climate change and disaster risk management strategies and plans. The action will assist ten Pacific SIDS to address climate change impacts at the national, sub-national and community levels in a sustainable manner and for specific sectors. The activities will adopt a gender-sensitive and rights-based approach throughout.

Climate Security Project

Although climate change is cited as the most significant security threat to the south pacific, its likely effects on security and potential conflict are yet to be widely explored by the international and regional organizations present on the ground. Climate change in the pacific region has the potential for a myriad of cascading fragility and instability risks. These will affect men, women and youth differently, and vary across the region both according to timeframes under consideration and depending on the country context. There are a range of critical climate fragility risks emerging in the Pacific Region that will require greater examination, monitoring and coordinated action by many stakeholders at the national, regional and international level to prevent potential irreversible economic, social, cultural and environmental damage with a range of potential security implications and a direct impact on social cohesion. Most critical issues amongst these include.

Managing Water Scarcity through Strengthened Water Resources Management Project

The Managing Water Scarcity through Strengthened Water Resources Management project responds to MFAT's Water Security Strategic Approach to address the climate change-related water security challenges faced by Pacific Island Countries. The Project is being implemented by the Pacific Community (SPC) over the three-year period from July 2020 to June 2023, and. builds upon the achievements, learnings, and enabling environments established through the MFAT-funded Strengthening Water Security of Vulnerable Island States (SWSVIS) project. This Project was also implemented by SPC and from 2015 to 2019 supported a range of activities to strengthen the availability, reliability and quality of drinking water in vulnerable and isolated communities in the Cook Islands, Kiribati, the Marshall Islands, Tokelau and Tuvalu. The SWSVIS project worked across multiple sectors within the participating countries to help develop and implement a suite of practical measures and tools that strengthened local capacity to anticipate, prepare for and respond to the impacts of drought. The new Water Scarcity Project represents a significant scaling up and refocusing of the activities implemented under the SWSVIS project. It aims to provide support to specific water-scarce communities to actively manage resources to improve resilience, in order that: • Communities have the infrastructure and capability required to access, collect and store water. • Communities understand, protect and maintain water resources and infrastructure; and• Communities are sustainably using water resources and managing risk. Implementation of the Project is now commencing in each of the five atoll nations of the Cook Is-lands, Kiribati, the Marshall Islands, Tokelau and Tuvalu.

Institutional Strengthening of Pacific Island Countries to Adapt to Climate Change

ISAAC project is a 3-year project commencing in 2017 and funded by USAID and jointly implemented by SPC, SPREP and PIFS covering 4 countries including Tuvalu, Fiji, Palau and Samoa. The main focal areas of ISAAC project are awareness and capacity building, policy development, climate change adaptation divided across three main key result areas; 1. Integrated Institutional frameworks and national capacity strengthened 2. Accessing Climate Finance 3. Regional cooperation and coordination and strengthening Some of the project's achievements include; 1. supporting the NIE accreditation process in providing assistance to develop tools under Ministry of Finance 2. Supporting review of Environmental Impact Assessment 3. Establishment of Environmental Social Safeguard (ESS) as one of the requirements for NIE

Accreditation process 4. Development of Payout policy and methodology for the Tuvalu Survival Fund 5. Supporting 20 students to peruse Project Management IV Courses 6. Supporting the development of the Climate Change Web Portal 7. Contribute and participate in Awareness Activities 8. Establish Data and Information for vulnerable sectors (in progress) 9. Awareness activities on the tools/policy and regulation developed (for 2019)
Objectives: - is to strengthen the national institutional capacity of Pacific Islands Countries (PICs) to effectively plan, coordinate and respond to the adverse impacts of climate change and disaster risk. It is intended to build on existing multi-sector, whole of island approaches that have been implemented successfully in other Pacific Countries.

Building Safety and Resilience in the Pacific

The Building Safety and Resilience in the Pacific project (BSRP) is committed to reducing the impacts of disaster and climate change on Pacific Island countries and communities. This is done through strengthening the region's ability to respond to existing and emerging challenges caused by hazards and climate change and is being achieved through targeted disaster resilience strategies and climate adaptation work. To help overcome these challenges the Building Safety and Resilience in the Pacific project is helping find practical ways to support countries to prepare for, respond to and recover from disaster. This is done through the implementation of Disaster Risk Reduction (DRR) strategies led by the countries involved in the project. These DRR strategies help assess disaster and hazard risks whilst putting measures in place to protect lives, assets and livelihoods.
Objectives: Reduce the vulnerability, as well as the social, economic and environmental costs of disasters caused by natural hazards, thereby achieving regional and national sustainable development and poverty alleviation in ACP Pacific Island States

Tuvalu Integrated Vulnerability Assessment

Tuvalu a country that consists of nine small atolls with a population of approximately twelve thousand people is mostly affected by climate change. The Tuvalu Integrated Vulnerability Assessment (TIVA) is a collection of existing secondary data and also views from the people to help carry out a vulnerability assessment. Tuvalu has signed a memorandum of understanding between its Government and the International Institute for Sustainable Development (IISD) regarding support for the Tuvalu Integrated Vulnerability Assessment (TIVA) by the National Adaptation Plan Global Network (NAP GB). The collection of data from all the Islands of Tuvalu started in the beginning of this year 2018 and its still in the process of developing a TIVA Data base to improve IVA-data consistency, storage and presentation.

Strengthening Water Security of Vulnerable Island States Project

Since 2015, under the sponsorship of the New Zealand Government, the Strengthening Water Security of Vulnerable Island States Project (shortened for the Water Security Project) started off in five island countries - Cook Islands, Kiribati, Republic of the Marshall Islands (RMI), Tokelau and Tuvalu. The project was particularly ignited by the 2011 drought epidemic in Tuvalu and thus developed to not only address impacts of drought in the five island countries but to also at least support and resolve other hazards on drinking water and its supplies. Such support has to be address through the project team efforts and the existing network of water related institutions on each of the five island countries. Thus, both the Government and Civil Societies have their own part to play in the mix of addressing water problems in each of the five implementing countries. The project is regionally coordinated by the SPC, and implemented at the national level by each of the five island countries.

Objectives: The key objective of the project is to address impacts of drought and other hazards on drinking water supplies in each of the five implementing countries - Cook Islands, Kiribati, RMI, Tokelau and Tuvalu.

Other projects

Other biodiversity initiatives include an Island Care project monitoring turtle, the establishment of a plant genetic collection by the Department of Agriculture, work on a Whale and Dolphin Action Plan and also the Regional Action Plan on Turtles in collaboration with the SPREP. A local NGO, TANGO has been facilitating the planting trees and mangroves and has been working with Kaupule to establish CAs and to produce management plans for them (two plans produced and two underway).

2. INTRODUCTION TO NBSAP

Convention on Biological Diversity

Tuvalu signed the Convention on Biological Diversity (CBD) at the Earth Summit in 1992, one of 150 countries to do so. The Convention has three main goals:

1. Conservation of biodiversity
2. Sustainable use of its components; and
3. Fair and equitable sharing of benefits arising from genetic resources.

National Biodiversity Strategy and Action Plan's (NBSAP) are the principal instruments for implementing the Convention at the national level as defined in Article 6. The Convention requires countries to prepare a national biodiversity strategy and to ensure that this is mainstreamed into the planning and activities of all those sectors whose activities can have an impact (positive and negative) on biodiversity. Tuvalu produced its first NBSAP in 2012 and this strategy is the second.

1st Tuvalu NBSAP

Tuvalu's first National Biodiversity Strategy and Action Plan 2012-2016 was identified as the first formal consolidated attempt to address biodiversity issues and constraints in Tuvalu in a comprehensive manner. A total of 13 thematic areas were confirmed as the priority focus (the number of actions in each are bracketed):

1. Climate Change and Disaster Risk Management (12 actions)
2. Traditional Knowledge, Cultural Practices and Indigenous Property Rights (10 actions)
3. Conservation of Species, Ecosystems (Marine, Coastal, Land Terrestrial) and Genetic Diversity (11 actions)
4. Community – Empowerment, Involvement, Awareness, Understanding and Ownership (14 actions)
5. Sustainable Use of Natural Resources (13 actions)
6. Trade, Biosecurity and Food Security (16 actions)
7. Waste and Pollution Management (9 actions)
8. Management of Invasive Species (7 actions)

Together with five cross-cutting themes:

1. Capacity Building, Education, Training, Awareness and Understanding (19 actions)
2. Sustainable Development and Environment Management (5 actions)
3. Mainstreaming and Financing Mechanisms (2 actions)
4. Legal Framework for Biodiversity and Law Enforcement (3 actions)
5. Monitoring and Evaluation (8 actions).

It was identified that all the cross-cutting issues were equal in importance and each needed to be addressed before any serious project activities were implemented.

The development of the country's Fifth National Report to the Convention on Biological Diversity submitted in June 2017 included a review of progress against the actions within the eight specific themes of the first NBSAP. Significant progress was made on Theme 1 including activities within NAPA 1, Ridge to Reef Project, and assessments following Cyclone Pam. Theme 2 saw progress through activities conducted by the Education Department, the development of a National Cultural Policy, and publications on flora, ethnobotany and fishes, though limited progress on preserving traditional knowledge or equitable sharing of benefits. There were many investigations conducted and reports/publications on biodiversity (Theme 3) but less progress on management plans and preserving genetic biodiversity. Building community capacity and empowering local management of biodiversity (Theme 4) has made progress and is a major focus of current projects like Ridge to Reef. The sustainable use Theme 5 includes conservation area management and the development of new conservation areas where some limited initial progress was made, and economic valuation and mainstreaming where there was little action. Theme 6 included promoting traditional agriculture where the Agriculture Department has been active, biosecurity where little had been achieved, and some awareness campaigns to increase use of local food. Theme 7 included awareness work on waste management but mores substantive programmes have developed recently. There was little achievement in relation to invasive species (Theme 8) except planning.

The development of the Action Plan for this second NBSAP was partly based on an assessment of which actions from the first NBSAP were still relevant and needed to be carried forward.

Process of development of this 2nd NBSAP

A one-day national workshop was held in November 2016 (photos below) as part of a Tuvalu National Climate Change Resilience Week, alongside a National Climate Change Summit, a National R2R Workshop, and a Showcase on Ozone Depleting Substances. Attendees included representatives of Government Departments and national project teams and island community members representing Funafuti, Nanumea, Nanumaga, Nui, Nukufetau, Vaitupu, Nukulaelae and Niutao, with the last covering the small population (<30 people) living on Niulakita.

A draft strategy was then developed and then share with key stakeholders to provide their feedbacks. A validation workshop was also conducted in order to validate all the information provided in the strategy. The strategy will then present to the Government Advisory Committee and Cabinet for endorsement.

Linkages to other Strategies

Te Kete - National Strategy for Sustainable Development 2021 to 2030

The Te Kete is committed to provide all Tuvaluans a peaceful, resilient and a prosperous life. Te Kete is focused at a high level of various planning processes which stipulate the broad national planning framework in which all subordinate island strategic plans, sector and corporate plans, annual plans and budgets will need to be aligned so they all follow the path towards achieving our national vision. This plan considered a 10-year strategic direction towards achieving our National Vision. It maps out 5 Strategic Priority Areas (SPAs); 20 National Outcomes (NOs) and 89 Key Strategic Actions (KSAs) presented in the Plan. Environment has considered under outcome 5 of the Strategic Priority Area 1 namely the Enabling Environment. The outcome aims to achieve the enforcement of EIAs in any development that required an impact assessment, improve waste management, implement an integrated geospatial information framework for monitoring the status of natural environment and improve developments in Tuvalu. Fisheries and Agriculture have also part of the plan under national outcome 7 and 8 of Strategic Priority Area 2. These two outcomes entail the sustainable management of fisheries and agriculture resources as these are the mainstay of food security in Tuvalu.

3. RESOURCE INFORMATION

3.1 Geomorphology & soils

The atolls of Tuvalu share a typical zonation of substrates between the ocean and the lagoon. There's an uplifted fringing ridge of limestone on the ocean side, then a raised beach or ridge of coral rubble, and behind this are areas of windblown sand and soil. Towards the lagoon edge are finer sediments derived from the lagoon. Finally, there may also be limestone outcrops or pavements or low-lying swampy areas occasionally inundated by the sea.

A recent study by Kench et al. (2017) used remotely sensed data to analyse shoreline change in all 101 islands of Tuvalu over the past four decades. They recorded a net increase in land area in Tuvalu of 73.5 ha (2.9%), despite sea-level rise, and land area increase in eight of the nine atolls. Island change was not uniform with 74% increasing and 27% decreasing in size, indicating the dynamic nature of atoll morphology.

The soils of Tuvalu are typically very poor, comprising loamy sands, acid peat soils, swamp or hydromorphic organic soils or muds in taro pits, and artificial soils. They are normally shallow, free draining, alkaline (pH 8.2 to 8.9) and deficient in nutrients needed by plants such as nitrogen, potassium, iron, manganese, copper and zinc (Morrison 1987).

3.2 Biodiversity

3.2.1 Marine ecosystems

Tuvalu's marine ecosystems have been classified as five types:

- Open ocean covering most of the 900,000km2 of the Exclusive Economic Zone (EEZ)
- Coastal/inshore waters
- Subtidal ocean-side reefs
- Subtidal lagoons
- Intertidal flats

Within these are a variety of habitat types, including algal flats, coral reefs, channels or reef passes, soft sandy and hard substrates, and seamounts.

Tuvalu's coral reefs support highly diverse marine biodiversity. Lagoons are important as fish nurseries and also possess distinctive fish faunas that vary from atoll to atoll. The lagoons of Nanumea, Nui, Vaitupu and Nukulaelae remain virtually closed to the surrounding ocean, whilst Funafuti lagoon contains numerous channels and passes to the outer ocean thus increasing natural flushing. Overall, damselfish, followed by wrasses, surgeonfish and parrotfish, numerically dominate fish communities in the lagoons.

The intertidal flats are important habitats for gleaning of fish, shellfish, crustaceans and other invertebrates, particularly women. Fishing off the reefs and in the lagoons using hand-lines, gillnets or trolling is practiced by members of most householders. A smaller number of people fish offshore in the open ocean.

3.2.2 Marine species

The coastal and inshore marine diversity of several of the islands of Tuvalu has been surveyed in detail in recent years. A literature review conducted as part of a Tuvalu Marine Life (TML) project tabulated the following marine species in the country (Job & Alefaio 2009):

- 532 species of fish, belonging to 72 families and 210 genera
- 411 species of macro-invertebrates belonging to 8 phylum and 92 families
- 379 species of cnidarians (corals, sea anemones, jellyfish, hydroids and siphonophores) belonging to 3 classes, 12 orders and 26 families
- 59 species of marine algae (seaweeds) belonging to 4 phylum and 25 families
- 4 species of sponges.

Field surveys were carried out as stage two of the TML in Nanumea, Nukulaelae, and Funafuti in April, May 2010 and a comprehensive report produced on reef fish biodiversity, marine resources in conservation areas and a documented marine life inventory (Job & Ceccarelli 2012).

3.2.2.1 Finfish

The TML survey in 2010 recorded 317 fish species including 66 not previously recorded in Tuvalu giving a country total of 607, which becomes 711 when applying a standard Coral Fish Diversity Index (Job & Ceccarelli 2012). Species richness was greatest in areas with greater complexity of habitats and least inside the lagoons of the three atolls. More recent studies suggest that there may be over 800 reef and inshore fish species, and once offshore and deep-water fish are added the total could be 900 or more (Thaman 2016).

Fish density was highest on Nanumea and lowest on Funafuti, though biomass was highest on Funafuti and lowest on Nukulaelae. There were signs of overfishing on Funafuti with lower abundances and smaller sizes than in the past.

It was concluded that Tuvaluan reefs had high fish biodiversity. Fish densities and benthic (bottom dwelling) communities reflected relatively low fishing pressure and reasonably healthy reefs, though

some exposed ones showed signs of storm damage. Funafuti lagoon showed evidence of pollution and nutrient enrichment near Fongafale with high cover of macroalgae.

Tuvalu Fisheries Department is undertaking surveys of the coastal fishery to improve livelihoods and food security. A 2015/16 creel survey collected catch data from fishers over several months in Funafuti and during survey trips to Nui, Nukufetau, Nanumaga, Nanumea and Niutao (Alefaio et al. 2016). Key findings were as follows:

- Fishers made on average 12 trips a month
- 87% of the catch was sold and 13% for home use.
- Hand-lining was the most common method and reef fishes the most commonly targeted
- 74% of fishers said numbers and sizes of fish had declined
- Coastal fisheries were overfished, particularly in Funafuti, with 60% of the species caught having 50% or more of the catch below the size of maturity.

3.2.2.2 Threatened fish species

Twenty-nine species of fish recorded in Tuvalu are listed on the IUCN Red List as threatened species, 10 classified as vulnerable (green) and one, the Maori wrasse considered endangered (blue) (Table 2). Only 11 of these species were seen during the TML surveys.

Species	Common Name	IUCN status	Seen on survey (Y)
Aetobatus narinari	Spotted eagle ray	Near threatened	Y
Alopias pelagicus	Pelagic thresher shark	Vulnerable	
Bolbometapon muricatum	Bumphead parrotfish	Vulnerable	Y
Carcharhinus amblyrhynchos	Grey reef shark	Near threatened	Y
Carcharhinus limbatus	Common blacktip shark	Near threatened	
Carcharhinus longimanus	Oceanic whitetip shark	Vulnerable	
Carcharhinus melanopterus	Blacktip reef shark	Near threatened	Y
Carcharhinus obscurus	Dusky shark	Near threatened	
Carcharhinus plumbeus	Sandbar shark	Lower Risk/ Near threatened	
Carcharhinus carcharias	Great white shark	Vulnerable	
Cheilinus undulatus	Maori wrasse	Endangered	Y
Epinephelus fuscoguttatus	Brown-marbled grouper	Near threatened	Y
Epinephelus lanceolatus	Giant grouper	Vulnerable	
Epinephelus polyphekadion	Camouflage grouper	Near threatened	Y
Epinephelus socialis	Surge grouper	Near threatened	
Galeocerdo cuvier	Tiger shark	Near threatened	

Species	Common Name	IUCN status	Seen on survey (Y)
Hexanchus griseus	Bluntnose sixgill shark	Near threatened	
Himantura uarnak	Honeycomb stingray	Vulnerable	Y
Isurus oxyrinchus	Shortfin mako shark	Near threatened	
Mobula japonica	Japanese devilray	Near threatened	
Plectropomus areolatus	Squaretail coral grouper	Vulnerable	Y
Plectropomus laevis	Black-saddled coral grouper	Vulnerable	Y
Prinace glauca	Blue shark	Near threatened	
Rhincodon typus	Whale shark	Vulnerable	
Sphyrna lewini	Scalloped hammerhead	Near threatened	
Sphyrna zygaena	Smooth hammerhead	Near threatened	
Stegostoma fasciatum	Leopard shark	Vulnerable	
Thunnus obesus	Bigeye tuna	Near threatened	
Triaenodon obesus	Whitetip reef shark	Lower Risk/ Near threatened	Y

Table 2: Threatened fish species recorded in Tuvalu (Source: Job & Ceccarelli 2012).

Job & Ceccarelli (2012) expressed concern at the low number of sharks during their survey as they play a key role in maintaining the health of the ecosystem as top predators. A shark policy is in draft form.

Island communities have local lists of species important to them that they consider under threat.

Characteristic fish species in different habitats

The TML survey found that the highest density of fish for all three atolls was represented by damselfish species, which were twice as abundant on Nanumea as on the other two atolls. Wrasses, surgeonfish and parrotfish made up the next most abundant families, and these were relatively uniform across the three atolls. Representatives of the other fish families occurred in very low densities (Job & Ceccarelli 2012).

The species characterising lagoonal areas of all three atolls were the damselfish *Pomacentrus amboinensis, P. pavo*, and *Dascyllus aruanus*; the blenny and goby *Ptereleotris microlepis, Amblygobius phalaena*, the wrasses *Labroides dimidiatus* and *Halichoeres trimaculatus*, the surgeonfish *Acanthurus xanthopterus*, the goatfish *Parupeneus barberinus*, the parrotfish *Scarus ghobban* and *S. schlegeli*, the grouper *Epinephelus merra* and the butterflyfish and *angelfish Chaetodon trifascialis* and *Centropyge bicolor.* Especially prevalent on Funafuti's lagoonal pinnacles was the fusilier *Pterocaesio trilineata* (Job & Ceccarelli op. cit.).

A different suite of common reef fish separated outer reefs from lagoons, including the damselfish *Chromis iomelas*, *C. atripes* and *C. xanthura*, the hawkfish *Paracirrhites forsteri*, the wrasse T*halassoma quinquevittatum,* the angelfish *Centropyge flavissimus*, the triggerfish *Melichthys niger* and *M. vidua*, the grouper *Cephalopholis argus* and the surgeonfish *Acanthurus nigricans* and *Ctenochaetus cyano-*

cheilus (Job & Ceccarelli op. cit.).

3.2.2.4 Corals

The three surveyed atolls had similar overall levels of hard coral cover (20-30%) similar to other atolls in the region. Funafuti atoll had high (20-50%) coral cover throughout both lagoonal and outer reef sites. Overall, coral cover on the three atolls appeared healthy, despite localised overgrowth by fleshy macro-algae near human settlements. Only small numbers of the crown of thorns starfish, a coral predator, were seen.

3.2.2.5 Macroinvertebrates

Job & Ceccarelli (2012) surveyed macroinvertebrate species used as food, bait, handicraft, or of other commercial value, or useful as indicators of reef health or disturbance, in and outside conservation areas on the three atolls. This included shellfish (bivalves and oysters), lobsters, octopus, sea cucumbers and sea urchins. Overall densities were higher on Nukulaelae than Funafuti or Nanumea, however for edible species there were low densities on Funafuti and Nukulaelae and moderate densities on Nanumea.

Giant clams were only observed in Funafuti lagoon, with higher densities inside the CA than outside. Trochus were found in low density in Funafuti, small numbers at Nukulaelae and none at Nanumea. Past re-stocking programmes have had limited success.

Sea cucumbers, considered important nutrient cyclers in coral reef systems, were recorded in very low densities in Funafuti lagoon and moderate to high densities in Nanumea and Nukulaelae, almost all lollyfish. Only a single individual of a high value commercial species was seen and it was concluded that such species are overexploited in the three atolls and require management and perhaps restocking (Job & Ceccarelli op. cit.).

The main species of shells used for handicrafts are cowries: Cypraea annulus, the gold-ring cowrie, C. moneta, the money cowrie (both Pule Kena), a black cowrie (Pule Uli) and C. caputserpentis, the snake-head cowrie. Cowries were found to be most abundant at Nanumea.

3.2.2.6 Marine Mammals

Job and Alefaio (2009) located references to 21 marine mammal species recorded in Tuvaluan waters: 3 rorqual whales; 12 pilot whales, killer whales and dolphins; 3 sperm whales; and 3 beaked whales.

Marine Reptiles

Three species of turtles are present in Tuvalu: the Green Turtle (Chelonia mydas) (endangered) the Hawksbill Turtle (Eretmochelys imbricata) (critically endangered); and the Loggerhead Turtle (Caretta caretta) (endangered)[1]. The Green Turtle is the only one that nests in the country and this takes place

1 The leatherback turtle (Dermochelys coriacea) is also referred to as present in the literature on Tuvalu (Job & Alefaio 2009) but it has not apparently been seen in recent years.

on most of the more isolated motu (islets) on all nine islands, such as Vasafua and Fuakea motu on the western side of Funafuti.

Turtles were caught traditionally in the past as a food for special occasions and this practice has reduced due to greater public awareness, though some take of eggs and occasional harvesting of adults occurs. Different islands have passed traditional rules designating no-take nesting areas (Tekinene 2010).
3.2.3 Terrestrial ecosystems

The main vegetation types present on Tuvalu comprise:

- Inland Broadleaf Forest and Woodland
- Coastal Littoral Forest and Scrub
- Mangroves and swampy wetlands
- Coconut Woodland and Agroforest
- Excavated Taro Pits
- Village House-yard and Intensive Vegetable and Food Gardens

The first three habitats listed are significant for the conservation of indigenous (native) plant species and associated fauna, whereas the second three are dominated areas by introduced species whose diversity it is important to conserve for food security. Table 3 shows the estimated land use/cover figures from c.1998.

Cover/Vegetation	Area (ha)	%
Coconut woodland	1,619	53.9
Broadleaf woodland	122	4.1
Coconut & broadleaf woodland	51	1.7
Scrub	419	13.9
Pandanus	10	0.3
Mangroves	515	17.1
Pulaka pits & pulaka basins	65	2.2
Village, buildings	172	5.7
Other (i.e., low ground cover)	33	1.1
Total	3,006	100

Table 3: Estimated areas of different land use/land cover types present in Tuvalu c.1998. (Source: 4th National Report to the CBD).

3.2.3.1 Forests

Inland Broadleaf Forest and Woodland

Relatively undisturbed areas of inland broadleaf atoll forest and woodland are rare on Funafuti, limited in area or represented by scattered remnant trees on most of the other main inhabited atolls, and now found mainly in small stands or scattered trees on uninhabited reef islets (motu) off the main inhabited atoll islets. These areas, particularly with the trees puka vai (Pisonis grandis) and tausunu (Tournefortia argentea), are important nesting habitats for Tuvalu's declining seabird populations.

Coastal Littoral Forest and Scrub

The least disturbed areas of coastal littoral forest and scrub are found on uninhabited islets and less populated rural areas of the inhabited islets. They are found on both the more exposed ocean coasts and on the lagoon coasts of most islets and are critical habitats for turtle nesting and for land crabs, and protect coastlines and beaches from erosion.

Mangrove Forest

Mangroves are found on all atolls except Nukulaelae, along protected intertidal lagoon flats or in back-beach basins, though they only cover small areas. Two mangrove species are present, the common mangrove, togo (Rhizophora stylosa), which is found on all atolls except Nukulaelae, and the red-flowered mangrove, sagale or hagale (Lumnitzera littorea), which is currently reported from only Nanumaga, Niutao, Nui, and Vaitupu.

3.2.3.2 Modified habitats

Coconut Woodland and Agroforest

The most widespread vegetation type in Tuvalu is agroforest - land dominated by deliberately planted or protected trees, mostly coconut palms, niu (Cocos nucifera). Other useful indigenous trees, such as pua (Guettarda speciosa), fao (Neisosperma oppositifolium) and nonu (Morinda citrifolia) are often protected and allowed to remain, and pandanus, breadfruit and other useful trees are planted.

Excavated Taro Pits

Taro pits (pela/vai pulaka) are found in the central parts of the larger islets near the main settlements, excavated to the level of the freshwater lens through the limestone to depths of 1.5 to 2 m. The rich soils in these pits are built up over many years by adding mulch or compost (kaiao) composed of leaves and other organic material. The main crop planted in the pela is giant swamp taro, pulaka (Cyrtosperma chamissonis).

Village Gardens and Amenity Plantings

A wide range of indigenous and non-indigenous trees, shrubs, vines and other perennials are planted in household gardens, and used as landscaping at government buildings, schools, and as hedges, living fences and roadside plantings. These areas contain a mixture of annual plants and many non-planted wild or weedy species.

Intensive vegetable and food gardens are increasingly important on Funafuti and other atolls such as Vaitupu, partly as a result of education initiatives. The soils of these gardens have been enriched by adding organic materials and imported fertilizers and manures.

Disturbed Ruderal Vegetation

Increasing urbanization and the development of roads and airports and other facilities have created extensive areas of continually disturbed "ruderal" vegetation (e.g., roadsides and waste places) especially on Fogafale Islet. The dominant plants are a wide range of easily-dispersed weedy species (grasses, sedges, other herbs and shrubs). Some weeds such as Sphagneticola trilobata and Leucaena leucoceph-

ala have become extremely invasive.

3.2.3.3 Wetlands

There are no surface freshwater resources in Tuvalu though limited areas of swampy wetlands are found on most atolls. There is groundwater, often slightly brackish in the form of a lens floating on the higher density saltwater beneath it. The location and degree of development of the groundwater resource influences the health of the vegetation and associated wildlife as well as the location of village wells and taro pits. On Funafuti the freshwater lens is most extensive and highly developed on the largest islet, Fogafale, but this still only provides a limited resource for the large population there is reliance on household and community rainwater catchment systems supplemented by limited desalination plants.

3.2.3.4 Threatened ecosystems

The country's 5th National Report to the CBD identified three terrestrial ecosystems under threat:

- Coastal forest & vegetation – where reclamation, land clearance, invasive species and over-exploitation place a variety of multi-purpose tree species, turtle and seabird nesting sites and land crabs at risk
- Mangroves – threatened by reclamation and overuse
- Agricultural ecosystems – where swamp taro gardens and cultivars of taro, breadfruit, pandanus and banana are under threat.
- Coral reefs, beaches, nearshore lagoon and oceanside marine ecosystems are threatened by coastal erosion, particularly from extreme weather events, and overfishing.

3.2.4 Terrestrial species

3.2.4.1 Plants

The flora of Tuvalu consists of 362 species or distinct varieties. Of these only about 59 (16%) are considered indigenous (Table 4) and the other 303 species (83%) have been introduced by people, some as early aboriginal introductions by Pacific Islanders into Tuvalu, and most more recently. There are no endemic plant species (i.e., unique to Tuvalu), with almost all of the indigenous plants being widespread, easily-dispersed pan-tropical or pan-Pacific coastal species that are adapted for the challenging conditions on atolls like Tuvalu e.g., limited soils, high salinity and sea spray, periodic flooding and drought. The low number of indigenous species is an indication of the lack of habitat diversity on atolls compared with larger high islands, the difficulty of cross-ocean dispersal by plants, and the difficulty of long-term survival in the harsh atoll environment which is dominated by high salinity (Thaman et al. 2012).

Class	Indigenous	Aboriginal	Recent	Total
Ferns and Fern Allies	6	-	3	9
Gymnosperms	-	-	2	2
Monocotyledons	11	8	84	103
Dicotyledons	42	6	200	248
Total	59	14	289	362

Table 4: Assumed origin of vascular plants reported present on Funafuti Atoll (Source: 5th National Report to the CBD).

3.2.4.2 Birds

There are 34 species of indigenous birds recorded in Tuvalu, approximately 20 of which are sea birds (Watling 1998).

	Seabirds/Shorebirds	Land and wetland birds
Resident Breeding Birds	White-tailed tropicbird - Tavake	
Red-footed booby – Te-Kena		
Crested tern (?)		
Black-naped tern - Matapula		
Sooty tern - Talaiki		
Bridled tern (?)		
Brown noddy - Gogo		
Black noddy - Lakia		
White tern - Akiaki	Eastern reef heron	
Banded rail		
Pacific pigeon		
Seabirds present year-round, not known to breed	Brown booby - Kotaa	
Great frigatebird - Katafa		
Lesser frigatebird - Katafa		
Irregular visitors (vagrants) - seabirds	Phoenix petrel - Lulu	
Audubon's shearwater - Takupu		
Wedge-tailed shearwater - Lulu		
Christmas shearwater		
Polynesian storm-petrel (?)		
Red-tailed tropicbird - Tavaketo-to		
Masked booby - Kotaa		
Grey-backed tern - Kalakala		
Blue noddy		
Migrant shorebirds	Pacific golden plover - Tuli	
Bristle-thighed curlew - Fouga		
Bar-tailed godwit - Kaka		
Wandering tattler - Kilikilitai		
Ruddy turnstone - Kolili		
Migrant landbird		Long-tailed koel (cuckoo) - Kaleva

	Seabirds/Shorebirds	Land and wetland birds
Irregular visitors (vagrants) – other groups	Whimbrel - Fouga	
Siberian tattler		
Sanderling - Kolili	Mallard - Toia	
Introduced breeding species		Junglefowl - Moa

Table 5: Birds of Tuvalu – species with recent confirmed records. (Source: Watling 2015 http://pacificbirds.com/tuvalu-checklist/)

No comprehensive bird survey of Tuvalu has been undertaken. The birds of the Funafuti Marine Conservation Area were assessed in 1998 where the six motu held breeding colonies of black and brown noddies and white terns, and hundreds of frigatebirds and brown and red-footed boobies roosting (Watling 1998).

3.2.4.3 Mammals

There are no indigenous land mammals in Tuvalu.

3.2.4.4 Reptiles

Tuvalu has five skink species, three gecko and a blind snake (Table 6). Seven species were found during the bird survey of the Funafuti Conservation Area (Watline 1998) including a gecko found on Tepuka and Fuakea Islets that was subsequently identified as unique (endemic) to Tuvalu, the Tuvalu forest gecko (Zug et al. 2003). Its conservation status has yet to be evaluated within the IUCN Red List.

Common name	Latin name
Tuvalu forest gecko	Lepidodactylus tepukapili
Oceania gecko	Gehyura oceanica
Mourning gecko	Lepidodactylus lugubris
Oceania snake-eyed skink	Cryptoblepharus poecilopleurus
Striped small-scaled skink	Emoia adspersa
Dark-bellied copper-striped skink	Emoia impar
White-bellied copper-striped skink	Emoia cyanura
Pacific moth skink	Lipinia noctua
Faint-striped blind snake*	Anilios broomi

* Blind snakes are small, harmless, burrowing worm-like snakes

Table 6. Terrestrial reptiles found in Tuvalu (Sources: Zug (2013) & the Reptile Database www.reptile-database.org).

3.2.4.5 Amphibians

There is only one amphibian present, the invasive cane toad (Rhinella marina) which was introduced from Fiji to Funafuti in the 1930s and then subsequently from there to Vaitupu, Nanumaga & Nukufetau.

3.2.4.6 Invertebrates – terrestrial

The terrestrial invertebrates of most significance to Tuvaluans are the land crabs of which seven species are eaten, including the coconut crab, uu (Birgus latro) and a mud crab, tupa (Cardisoma carniflex). Smaller species are used as bait for fish or bird traps. Land snails include four endemic species and others such as misa (Melampis spp.) used to make shell leis (ula) and other handicrafts.

3.3 Conservation Areas

3.3.1 Marine

An Action Plan for implementing the CBD's Programme of Work on Protected Area (POWPA) submitted in 2011 identified 11 marine conservation areas (CA's) on nine islands covering a total area of approximately 75km2 (Table 7) comprising both formal and informally designated sites. Recent initiatives through the Ridge to Reef project have seen all but one of these increase in size, some significantly.

Island	Designation	Institutional Setting	Designation Date	Area (km2)	
				Initial	2018
Funafuti	Conservation area	Nationally recognised Kaupule/Fisheries	1996	35.95	40.0
Vaitupu	Conservation area	Kaupule	2003	1.06	1.5
Nukulaelae	Fisheries reserve	Kaupule	2006	1.46	31.85
Nanumea		Kaupule	2006	2.52	5.2
Nukufetau	Conservation area	Kaupule	2006	11.75	133.97
Nui		Kaupule	1997	6.67	18.12
Niutao		Kaupule	Not recorded	0.522	1.68
Niulakita		Kaupule	Not recorded	14.73	0.21
Nanumaga		Kaupule	Not recorded	0.02	2.078
Total Area				**74.68**	**234.6**

Table 7: Marine Conservation areas

Funafuti's CA is a Marine Protected Area (MPA) legally gazetted through national legislation establishing legally binding no-take zones. Community-managed Locally Managed Marine Area (LMMA) systems have been adopted on the other islands, using traditional management practices with limited enforcement capacities. For example, on Nukulaelae spear fishing was prohibited over 40 years ago in certain areas. The lagoon surrounding its main settlement of Fagaua was declared "koga tapu" over 20 years ago and as a result the varieties of species of fish increased.

3.3.2 Terrestrial

Every island in Tuvalu has established terrestrial protected areas since 1996, with the aim of regenerating island forests (Table 8). Some islands have been applying conservation measures on land to allow for the regeneration and conservation of species for future consumption. For example, to allow for the sustainable consumption of coconut crabs, certain islets are protected with harvest bans for a period of six months or more, and when these islets are opened for harvesting others are closed.

Island	Designation	Institutional Setting	Area (km2)	
			Original	2018
Funafuti	Conservation Area	Falekaupule	0.109	0.08
Vaitupu	Conservation Area	Falekaupule	0.231	0.455
Nukulaelae	Conservation Area	Falekaupule	1.65	1.65
Nukufetau	Conservation Area	Falekaupule	1.01	1.01

Nui	Conservation Area	Falekaupule	1.65	1.65
Total Area			**4.65**	**4.845**

Table 8: Terrestrial Conservation areas

3.3.3 Funafuti Conservation Area

The Funafuti Conservation Area (FCA) which has both marine and terrestrial components, designated in 1996 has been the subject of several surveys of marine habitats and birdlife (Kaly (1997), Kaly et al. (1999), Watling (1998)). The most recent 2012 marine survey recorded coral cover averaging 15% which appeared to be a decline from previous surveys, with Acropora branching and staghorn corals the dominant types. There was no clear relationship between the FCA and exploited species, whether fish or invertebrates. Stations outside the FCA had the highest coral cover and edible macroinvertebrate density. However giant clams and trochus were more abundant within the FCA, and the reef slopes of Fuafafu motu had the highest edible fish density (Job & Ceccarelli (2012)). Stations within the Nukulaelae CA had higher coral cover and higher densities of edible fish and macroinvertebrates than stations outside the CA (Job & Ceccarelli op. cit.).

4. LEGAL, POLICY AND INSTITUTIONAL CONTEXT

4.1 Legislation

A thorough review of environmental legislation was conducted by Powell (2007) and key environmental management and protection laws were identified in the project document for Tuvalu's Ridge to Reef Project. Those of most relevance for biodiversity conservation are listed below along with more recent legislation:

Land and Marine Management Legislation

- Environment Protection Act 2008 (revised) - an Act to provide for the protection and management of the environment in Tuvalu and related purposes. It includes an objective:
  - o 'to promote the conservation and, where appropriate, sustainable use of biological diversity and the protection and conservation of natural resources, on the land, in air and in the sea'.
- It addresses a variety of environmental threats including pollution and waste.
- Closed District Act-declaration of closed areas.
- Marine Zone (Declaration) Act-regulation of marine waters including EEZ.
- Mineral Development Licensing Act- regulation of mineral exploitation.
- Native Lands Act-relates to native lands and registration of titles.
- Prohibited Areas Act- declaration of certain islands and water as prohibited areas.

Marine Resources

- Marine Resources Act 2008 revised - an Act to make provisions for the promotion and regulation to ensure the long-term conservation and sustainable use of the living marine resources for the benefit of the people of Tuvalu, and connected purposes. The principles to be taken into account by the Minister include:

a) adopt measures which ensure long-term sustainability of fish stocks
b) assess the impacts of fishing, other than human activities and environmental factors on target stocks, and non-target species, and species belonging to the same ecosystem or dependent upon or associated with the target stocks;
c) conserve marine ecosystems, including protecting biodiversity in the marine environ ment;
d) adopt strategies to ensure that aquaculture development is ecologically sustainable.

There is also provision to declare any stock or species of fish as protected which is identified as endangered or likely to become endangered.

- The Marine Resources (Amendment) Act 2012 implements a number of changes to the principal act to ensure that Tuvalu's international, regional and national rights and responsibilities in relation to fisheries conservation, management and development are accommodated. The Amendment significantly increased the level of penalties for various types of offence under the Act.

- Maritime Zone Act - It define the rights of Tuvalu in the maritime zones, contagious and exclusive economic zones.

Coastal management and protection

- Foreshore and Land Reclamation Act - declaration of ownership of foreshores and regulates reclamation projects.

Conservation of flora and fauna

- Plants Act 2008- protection of endangered or culturally important plants.
- Wildlife Conservation Act 2008 - protection of birds and animals and establishment of conservation reserves.
- Conservation Area Act 1999 – this Act indicates that no person will hunt, kill or capture any turtle, birds, or fish in designated CA's. The objectives of the Act include:
    - Protecting the environment, including coastal, marine and terrestrial;
    - Conserving natural resources of island communities and in providing for their sustain able utilization for the present and future generations;
    - Preserving the biological diversity of conservation areas, especially species which are en demic, threatened, or of special concern and the coastal and marine habitats upon which the survival of these species depends.

Invasive Species

- Biosecurity Act 2017 – An Act to establish the bio-security administration for the safe importation and monitoring of animals, plants, ants and their products into Tuvalu.

The purposes of this Act are –

(a) to protect Tuvalu against the entry of regulated pests and diseases affecting animals, plants, human beings and the environment;

(b) to carry out surveillance and monitoring of pests and diseases in Tuvalu and assess the status of regulated pests and diseases;

(c) to prevent the establishment and spread of regulated pests and diseases and the release of or ganisms that might adversely affect animals, plants, human beings and the environment in Tuva lu;

(d) to eradicate, contain or control the movement of regulated pests and diseases that are already present in Tuvalu;

(e) to prevent the introduction and spread of regulated pests and diseases not already present in Tuvalu;

(f) to facilitate the safe importation of animals and plants and their products, and related equip ment and technology;

(g) to facilitate the export of animals and plants and their products in accordance with the biosecu rity requirements of the receiving countries;

(h) to facilitate international cooperation to prevent the spread of pests and diseases affecting plants, animals, human beings and the environment.

Conservation areas

- Conservation Areas Act 2008 - An Act to make Provisions for the Declaration and Management of Conservation Areas (CA's) and Related Purposes. These include:
    - Minister may declare any part of the territory of Tuvalu as a Conservation Area upon receipt of a report of a Kaupule and after due consultation with the Kaupule.

- Responsibility for management of CA's lies with the Kaupule and a management plan is to be produced
- Establishment by the Kaupule of a Conservation Area Fund which shall be used for the management of the CA
- Identification of offences, including a prohibition on hunting, killing or capturing any tur tle, bird or fish
- Allowing for the Kaupule to issue by-laws for the implementation of the Act

Funafuti Conservation Area Order 2008 – Establishes the boundaries of the Funafuti Conservation Area.

Island Governance

• The Falekaupule Act 2008 provides the legal underpinnings for the current decentralization process and ushered in the current two-tiered governance system. The FA outlines the functions of the Kaupule which include:

- to ensure the proper management and use of the physical and natural resources in the Kaupule/Falekaupule area
- to provide for the improvement and control of fishing and related industries in accor dance with the Fisheries Act
- to prohibit, restrict or regulate the hunting, capture, killing or sale of animals, reptiles, birds or fish in accordance with the Wildlife Conservation Act': and the Funafuti Conser vation Area Order (1999), promulgated under the Conservation Areas Act of 1999.

A legislative review identified the absence of any specific legislation for the management and conservation of turtles (Tekinene 2010).

4.2 International Conventions

Tuvalu is a signatory to the following conventions of relevance to biodiversity conservation (Table 9).

Convention/Agreement	Ratified
United Nations Convention on Biological Diversity (CBD)	2002
The United Nations Framework Convention on Climate Change (UNFCCC)	1992
Kyoto Protocol to the United Nations Framework Convention on Climate Change	2001
United Nations Convention to Combat Desertification (UNCCD)	1998
United Nations Convention on the Law of the Sea (UNCLOS)	1996
Agreement on Straddling Fish Stocks and Highly Migratory Species	1997
Convention for the Protection of Natural Resources and Environment of the	
South Pacific Region (SPREP Convention)	1986
The International Plant Protection Convention (IPPC)	2005

Nagoya Protocol on Access and Benefit Sharing	2018
South Pacific Forum Fisheries Agency Convention 1979	1979
Convention on the Conservation of Migratory Species of Wild Animals	Non-party
United Nations Law of the Sea Convention	2002
International Convention for the Prevention of Pollution from Ships	1973
MARPOL Convention Protocol	1978
Stockholm Convention	2004
Protection of the World Cultural and Natural Heritage (1972)	2023

Table 9: International Conventions ratified by Tuvalu.

4.3 Policies and plans

Te Vaka Fenua o Tuvalu - National Climate Change Policy 2021 - 2030

This National Climate Change Policy 2020-2030, Te Vaka Fenua o Tuvalu, has been developed to respond to the needs of our people. The policy advances our national priorities set out in the National Strategy for Sustainable Development 2021-2030 Te Kete, some of which contribute towards addressing regional and international commitments on climate change. The policy draws on evidence and findings from numerous assessments, including the review of the previous climate change policy and its strategic plan of action in 2016 and the nation-wide consultations on the initial framework for this policy in 2018. The National Advisory Council on Climate Change (NACCC) played an important role in both processes by providing strategic guidance and technical advice to the Climate Change Department (CCD). Island leaders and communities, including the Falekaupule, Kaupule, women, youth and people with disabilities, made valuable contributions and recommendations. This policy is an articulation of the voices, aspirations and actions of the people of Tuvalu.

Tuvalu National Strategic Action Plan for Climate Change and Disaster Risk Management (NSAP) 2012 - 2016

The NSAP is a joint strategic action plan for climate change adaptation and mitigation, and disaster risk management, and the operational plan for Te Kaniva. It sets out strategies and actions under seven thematic goals of which goal 1: 'strengthening adaptation actions to address current and future vulnerabilities' links most strongly to biodiversity conservation. Its strategies include:

- assessment of salt and heat tolerant food crops and tree species for coastal protection
- coordinated planning and management of marine, coastal and land resources and systems
- responding to possible changes in migratory marine fish movements
- developing legislation and policies for sustainable resource management.

It is identified that implementation of the NSAP should be linked to the implementation of the NBSAP and actions can be shared between the two.

Tuvalu Integrated Waste Policy and Action Plan 2017-2026

This provides a roadmap to improve waste management which in turn will improve the health and the living environment for all Tuvaluans, including their biodiversity. It maintains a government priority on

the management of solid waste including hazardous waste, a challenge given the small land area available in the country and relative lack of capacity and resources. The policy combines efforts to minimise waste to landfills with a 'polluter pays' principle and actions to improve coordination and cooperative approaches.

Tuvalu Agriculture Strategic Marketing Plan 2016-2025

This plan aims to increase local food production and revive local and international trade in agricultural products, as part of the country's response to the challenge of climate change. It includes actions that relate directly or indirectly to biodiversity conservation. Efforts to increase production could lead to the clearance of further native habitats, but would be more beneficial if they were directed at making better use of areas currently used for agriculture, e.g., replacing old coconut trees, making pulaka pits more efficient, and promoting organic practices. There is an agri-biodiversity objective to preserve and breed more climate-resilient food crops and tree varieties.

Tuvalu National Culture Policy Strategic Plan 2018-2024

Tuvalu's National Culture Policy (Govt. of Tuvalu 2018) has the vision of "Instilling pride to live and practice the norms, values and traditions of our culture to the fullest in pursuance of better sustainable livelihoods".

The first goal of the policy is to safeguard, protect and transmit the country's cultural heritage and to promote awareness of the linkages between cultural and biological diversity through the protection and encouragement of the customary use of its ecosystems.

Outputs related to biodiversity conservation are included in the NBSAP Action Plan.

Tuvalu National Youth Policy 2015 – 2019

One of the objectives of this policy is to increase participation of youth promoting sustainable development. It is identified that the small land area of Tuvalu supports a limited plant variety whereas the vast ocean surrounding each island is abundant with different species of marine life. Past generations were environment-friendly and the natural ecosystem supported the life style they pursued. However, the increase in population in Funafuti is posing the risk of degradation of the environment. Youth's concerns around the issue of rising sea levels and erosion of shore lines along with the increase in Cyclone activity and more prominent King Tides provides an insight to their willingness to be part of the solutions. Therefore, this Policy supports the continuation of current initiatives aimed at conserving the environment and youth being encouraged to play an active role in such activities. This can be achieved through training youth in the preservation and care for the environment and the natural resources and showing a sense of appreciation of nature. They can then work in partnership with the Environment Unit and other organizations to promote conservation of all Islands in Tuvalu.

Funafuti Reef Stewardship Plan 2017

This plan (Makolo et al. 2017) has been developed as a cooperative arrangement between Tuvalu Fisheries Department and Funafuti Kaupule to reverse past damage to inshore resources caused by overfishing and environmental decline. It aims to increase the supply of fishes, invertebrates and other seafoods, improve the state of the ecosystems that support them, and to reduce problems with ciguatera (see p.?), algal overgrowth and coastal pollution. It has four main strategies:

1. Strengthening the Funafuti CA to protect spawning adults and act as nursery to stock surround ing areas
2. Limiting size of fish that can be caught to ensure that more can reach breeding age
3. Targeting pelagic and offshore fisheries to reduce pressure on reef fishery
4. Increasing community awareness and involvement and taking action to improve the marine ecosystem.

Key activities from the plan are included within Theme 3 of the NBSAP Action Plan.

4.4 Institutions and organisations involved in biodiversity conservation

4.4.1 National

Ministry of Public Works, Infrastructure, Environment, Labour, Meteorology and Disaster (MP-WIELMD) _ Department of Environment.

The Ministry is responsible to; provide accommodation and property management services to all government ministries and the provision of public infrastructure; protect the fragile environment of Tuvalu and manage and conserve its already scarce resources, pursue the attainment of decent work standards through the promotion of employment opportunities under the labour schemes; provide quality weather and climate observations and forecast; develop, promote and implement measures to prevent and counter the impact of disasters in the country. The Ministry's work is reflected in programmes aimed at enhancing service delivery.

Ministry of Local Government and Agriculture (MLGA) – coordinates development work on the outer islands.
Through five program areas, the Ministry provides and ensures a distributive growth of Tuvalu's economy by providing policy direction and coordinating implementations; enhanced economic and social development in the outer islands through their Kaupule empowerment and community participants; promotes the social well-being for individuals; to facilitate, preserve and protection of valuable cultural heritage in Tuvalu through systematic recording and documentations; minimizing the negative effects of solid waste on Tuvalu's environment through prudent policy, legislation and sustainable systems. It is responsible for the National Culture Policy Strategic Plan and the development of the Tuvalu Integrated Waste Policy and Strategic Action Plan.

Ministry of Fisheries and Trade – Department of Fisheries, Department of Trade
The Ministry has to maximize social and economic returns through the sustainable management and harvesting of all agricultural resources, the sustainable management and harvesting of marine resources; and facilitating maximum land usage by maintaining a register of all available land resources.

The Department of Agriculture has divisions of Livestock, Crops & Agroforestry, Quarantine, and Information & Extension. It has Agriculture Officers and plant nurseries on each island; and a Plant Protection Officer, Quarantine Officer who together with a trainee extension officer cover biosecurity at the international airport.

The Department of Fisheries includes divisions of Fisheries Operations & Development, Coastal Fisheries, and Oceanic Fisheries.

Ministry of Finance – Climate Change Department

The Ministry of Finance is the financial institution of the Government of Tuvalu. The key functions are to manage public resources; ensure efficiency in public spending; oversee national planning for economic growth; provide policy advice for the fair distribution of public resources to all citizens; and ensure investment returns are sufficient to reinvest to achieve a sustainable economic wellbeing. The Climate Change Department is under this Ministry and it main role is to provides strategic & technical advice to all climate change initiatives and is responsible for the implementation of United Nations Framework Convention on Climate Change. Current projects overseen by the Unit include the National Adaptation Program of Action (NAPA II), Integrated Water Resource Management Project, Managing Coastal Aquifers Project (MCAP), Tuvalu Third National Communication Project, Global Climate Change Alliance Plus Scaling Up Pacific Adaptation (GCCA+ SUPA), Climate Security Project, Managing Water Scarcity through Strengthened Water Resources Management Project, Institutional Strengthening of Pacific Island Countries to Adapt to Climate Change, Building Safety and Resilience in the Pacific, Tuvalu Integrated Vulnerability Assessment, Strengthening Water Security of Vulnerable Island States Project and the Tuvalu Coastal Adaptation Project.

Tuvalu National Council of Women (TNCW)

The TNCW is the only women's NGO in Tuvalu. It is the umbrella body for 17 affiliates, represented on all eight islands through two women's leaders per island and it has strong ties with rural women at the grass-roots level. TNCW focuses on economic empowerment of women through programmes such as handicraft/sewing/catering. It also focuses on supporting various projects in providing support to consider needs of women in any project activities.

Tuvalu Association of Non-government Organisations (TANGO)

TANGO is a non-profit member organisation that aims to help and support healthy and sustainable development of NGOs in Tuvalu through the provision of training, services and information and through encouraging collaboration and communication between NGOs, government and international agencies. It is the host organisation for the Global Environment Facility (GEF)'s Small Grants Programme. Current projects include two with a biodiversity focus: A Reef Coastal Program to assist communities establish and manage conservation areas and preserve reefs and coastal areas; and a Community Capacity Building project on turtle conservation and protection.

Alofa Tuvalu

A France-based NGO, Alofa Tuvalu was formed after the threat to Tuvalu from climate change was identified as possibly the first nation to be submerged. After a film "Trouble in Paradise" was produced in 2003 the founder of Alofa Tuvalu developed an assistance project "Small is Beautiful" and formed the NGO in February 2005. Alofa Tuvalu ran a major Marine Life project from 2009 to 2011 with the support of the Government and outside donors. The first phase was a literature review, followed by surveys of reefs and lagoons on Funafuti, Nanumea and Nukulaelae.

Tuvalu Overview

Tuvalu Overview is a Japanese-based NGO that aims to spread awareness of the situation in Tuvalu and find solutions to the problems which have developed as a result of global warming. It is active in edu-

cation and building capacities of youth in mangrove planting and waste recycling.

Fuligafou

Fuligafou is a registered NGO in Tuvalu and its main purpose is to promote and help protect the environment from impact of climate change. It also helps build capacity of the community to be able to deal with environmental problems. The organization has been doing coral planting in Funafuti and Nui and will continue to support Tuvalu in other environmental activities.

4.4.2 Individual Island level

There are three main organisations on each island:

- Falekaupule – the traditional assembly that is the main decision-maker
- Kaupule, the executive arm of the Falekaupule
- Falekaupule Assembly – the consultative forum that includes anyone 18 years and above.

5. VISION, GOAL, THEMES & TARGETS

5.1 Vision

By the year 2024, Tuvalu would have a clean and healthy environment, full of biological resources where present and future generations of Tuvalu will continue to enjoy the equitable sharing of benefits from Tuvalu's abundant biological diversity'.

5.2 Mission

We shall apply our traditional knowledge, together with innovations and best practices to protect our environment, conserve and sustainably use our biological resources for the sustainable benefit of present and future Tuvaluans.

5.3 Goals

- To promote and strengthen the conservation and sustainable use of Tuvalu's biological diversity
- To protect wildlife through the management of conservation areas
- To protect marine habitats and control overharvesting in high seas and territorial waters
- To prevent the arrival of new control and minimise invasive species and manage those present to minimise their impacts
- To rehabilitate and restore degraded ecosystems
- To prevent air, land, and marine pollution
- To recognize, protect and apply traditional knowledge innovations and best practices in relation to the management, protection and utilization of biological resources

5.4 Themes

The Action Plan is grouped according to the following six themes:

1. Conservation of ecosystems
2. Conservation of threatened species
3. Sustainable use of natural resources
4. Invasive species management
5. Traditional knowledge, cultural practices & indigenous property rights
6. Climate change linked to biodiversity
7. Information management

5.5 Targets

Annex 1 identifies targets and indicators from three international sources and one national one:

- Aichi targets from the CBD's Strategic Plan for Biodiversity 2011-2020
- Millennium Development Goals for 2015 - established following the Millennium Summit of the United Nations in 2000.

- Sustainable Development Goals for 2020 -17 – established by the United Nations in September 2015
- Te Kakeega III 2016-20

These are incorporated within the different Themes of the Action Plan that follows.

The following abbreviations are used in the Action Plan:
DOA – Department of Agriculture
DOE – Department of Environment
DOF – Department of Fisheries
FOFA – Fishermen on Funafuti Association
FRFSP – Funafuti Reef Fisheries Stewardship Plan
MPWIELMD - Ministry of Public Works, Infrastructure, Environment, Labour, Meteorology and Disaster
MLGA - Ministry of Local Government & Agriculture
MFT – Ministry of Fisheries & Trade
R2R – Ridge to Reef Project
SWA – Solid Waste Agency
TB – Tuvalu Biosecurity

6. ACTION PLAN – BY THEMES

6.1 THEME 1: Conservation of ecosystems

The creation and management of conservation areas (CA's) to look after important or representative habitats is a key activity under this theme. Other measures can also be taken to conserve threatened ecosystems and to enhance the conditions for native fauna and flora in areas whose primary purpose is not conservation, e.g., agricultural lands.

Conservation Areas

The Conservation Areas Act 2008 identifies that CA's can have one or more of the following objectives:

a) to protect the environment, including coastal, marine and terrestrial

b) to conserve the living and non-living natural resources of the island communities and to provide for their sustainable utilization by present and future generations;

c) to preserve the biological diversity of the conservation area, especially those species which are endemic, threatened, or of special concern and the coastal and marine habitats upon which the survival of these species depends;

d) to preserve and enhance the natural scenic beauty of the conservation area including sites that are already degraded or those that may become degraded if not protected;

e) to promote the enjoyment by the public of the conservation areas; and

f) to promote the scientific study and research in respect of the conservation areas.

Currently there are conservation areas of varying degrees of protection in each atoll, both marine (Table 7) and terrestrial (Table 8) with the first and largest being the Funafuti CA. Increasing the total area covered by CA's was a key indicator for the R2R project and significant progress has been made on extending existing areas as the tables show.

Improving the management of existing conservation areas is equally as important as establishing new ones and is also a key outcome of the R2R project. The Ridge to Reef Project in collaboration with the Tuvalu Fisheries Department have development management plan for each island for the sole purpose of improving the management of each island conservation areas. Job & Ceccarelli (2012) emphasised the need to strengthen and enforce their regulations for Conservation Areas as the lack of compliance with no-take areas will severely hinder any benefits of the CA. They found poaching at Funafuti CA with fishing lines observed around Fuafatu and Tefala islets and dead clam shells were on Fuafatu fringing reef. The Funafuti CA still does not have an implemented management plan though it was established eleven years ago. This has been due to lack of financial resources to support the implementation. Recently, the department has secured some funding from World Bank through PROP to implement some of the activities under these island management plans. The design of some existing CA's could be improved; for example, Nukulaelae has a tapu protecting half of a turtle nesting beach, however this needs modification to cover the full height of the beach as the sex of hatchlings is temperature dependent.

Periodic monitoring of CA's is needed to provide information on their effectiveness and by doing so encourage communities to respect 'no-take' areas. Job & Ceccarelli (2012) provided detailed recommendations on how monitoring should be carried out using consistent methodologies.

Conservation area targets:

Aichi target 11 relates to this theme: By 2020, at least 17 per cent of terrestrial and inland water areas, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

However, it is agreed that such a target is inappropriate for a country like Tuvalu based on a series of small islands where most land is communally-owned. As of 2010 the World Database on Protected Areas identified that 0.4% of Tuvalu's terrestrial surface was protected and by 2018 this figure has been increased significantly to 18.7% of terrestrial surface (4.85 km2 protected of 25.9km2 land area). The database identified 0.2% of territorial waters as marine protected areas and 725,782

Te Kakeega III has the following KPI: Conserve at least 10% of coastal and marine areas, consistent with international law, based on the best scientific evidence.

The R2R project has a target of expanding the area of marine CA's by 15% or approximately 1200ha and by October 2018 it had achieved the addition of 136ha.

Reducing ecosystem threats

The Funafuti Reef Fisheries Stewardship Plan (Makolo et al. 2017) identified the following threats to coastal ecosystems:

- Reducing sewage seepage into the lagoon – to address problems with ciguatera and algal overgrowth
- Beach replenishment and seawall projects leading to losses in fish habitat
- Pollution from domestic and agricultural chemicals.

Restoring ecosystems

Restoring degraded ecosystems could be considered within this theme. For example, in relation to coral reefs, an experimental project was carried out at in 2007-09 at Lofeagai reef, Funafuti to trial the transplanting of staghorn corals. An area of 500m2 was restored at a cost of Euro126/m2 which was considered expensive though the researchers considered that costs could be reduced in future now a methodology has been established (Fisk & Job 2009). The Ridge to Reef project is currently investigating coral gardening (see action table below).

Establish New Conservation Areas (CA's)

Objective	Actions	Targets	Means of verification	Responsibility	Financing
Increase area of marine conservation areas	Conduct biodiversity baseline survey with communities in the 9 islands. Endemic coastal vegetation, marine ecosystems (seagrass/coral) and other biodiversity hotspots to be identified. Review of current extent, status and potential for expansion of 11 Tuvaluan Locally Managed Marine Areas (LMMAs) including Marine Protected Areas (MPAs) located across 9 islands. Through community consultation and scientific assessments identify and agree on specific locations for LMMA/MPA expansion by 15%.	At least identify 30 species either marine or terrestrial to be monitored. Expand by 15% of the current LMMA including MPAs (marine & terrestrial). At least carry our consultations with the 9 island communities.	Compilation of reports for the community-based bio rapid assessments; (Funafuti & Outer Islands-2 separate reports). Formulation of draft shape files for LMMAs and MPAs on all islands. Reports of consultation carried out.	DoE, TFD, Kaupule, Island communities	R2R, TFD

Increase area of terrestrial Conservation Areas	Review current terrestrial CA's to determine their effectiveness and coverage of key habitats Work with communities to establish new conservation areas as required	At least carry out a feasibility study (scientific biorap)	Report of scientific bio rap-yet to be carried out this year (2019	DoE, DoA, TFD Kaupule, Island communities	R2R, TFD

Enhance management of existing conservation areas

Objective	Actions	Targets	Means of verification	Responsibility	Financing
Develop and implement management plans for marine CA's	Review the current management system and traditional Kaupule CA management plans as inputs to the LMMA/MPA plans in 9 sites.	To at least conduct 9 consultations on all islands	Management Plans & Monitoring Plans for LMMAs	DoE, TFD, Kaupule, Island communities	R2R
Improve enforcement of marine CA's	Community-based enforcement system for LMMA/MPA management plans developed and implemented by community members and R2R Island Officers	To at least raise awareness to communities and to form a LMMA network.	Reports and ToR for LMMA network	DoE, TFD, Kaupule, Island communities	R2R

Strengthen fish protection within Funafuti CA	Promote, educate and enforce Funafuti CA as a no-take breeding reserve	To conduct school outreach for primary and secondary		Kaupule, TFD	FRFSP
Undertake monitoring of marine CA's	Community-based monitoring system for LMMA/MPA management plans developed and implemented by community members and R2R Island Officers Build capacity of communities on the community-based monitoring system developed	To implement management plans for all outer islands To train at least 10 members of the community on the community monitoring system.	Quarterly reports to be produced by island Officers for R2R based in outer islands Monitoring report	DoE, TFD, Kaupule, Island communities	R2R
Improve the protection of terrestrial protected areas	Demarcation map for each island terrestrial protected areas are provided to the community Create a by-law to protect those species that are protected in these terrestrials protected areas	To raised awareness of the community on the island terrestrial protected areas. To have written laws in order to protect these areas from trespassing overharvesting the resources in these areas	Demarcation Maps for Terrestrial protected Areas Written By-laws	DoE, TFD, Kaupule, Island Communities	R2R

Conservation of Threatened Native Ecosystems

Objective	Actions	Targets	Means of verification	Responsibility	Financing
Conservation of coastal forest & vegetation	Develop island-specific planting programmes for priority tree species	To at least plant 100 tree in those threatened species.	Planting programs	TFD, DoA, Tuvalu Overview	CCD, DoE
Conservation of mangroves	Undertake further planting programmes to protect coastlines Educate people to reduce clearance of mangroves and dumping of rubbish	To plant coastal plant that could protect the coastline from erosion To raise awareness of the community on the important of mangroves to coastline and how to proper manage rubbish.	Planting Programs Awareness Programs and report	TFD, DoA, Tuvalu Overview	CCD, DoE

Conservation of coral reefs, beaches, near-shore lagoon and ocean-side marine ecosystems	Improving sewage systems to reduce seepage into the lagoon Minimising the loss of fish habitat in beach replenishment and seawall projects Reducing pollution from solid waste seepage, domestic and agricultural chemicals.	To encourage family to have close septic tank rather than having them bottomless. To promote the use of soft solution in coastal areas To promote the use of organic fertilizer for gardening	Awareness Program on having a good home sewage system Awareness programs on soft and hard solutions Awareness programs on use of fertilizer.	TFD, PWD, DoE DWM	DoE, DWM, PWD
Restoration of coral reefs	Research the opportunity for coral gardening. Implement coral gardening if appropriate and assess outcomes.	To carry out scoping on possibility for coral replanting and restoration To monitor and expand nursery sites for corals.	Scoping report –already done in Funafuti only but will expand the initiative to Nukulaelae.	TFD, DoE	R2R

6.2 THEME 2: Conservation of Species

This theme places emphasis on species that are globally threatened or in decline in Tuvalu. Theme 3 addresses species directly used by Tuvaluans that are in need of conservation action because current levels of use are not sustainable.
Globally threatened species present comprise turtles, several sharks and other fish, and the bristle-thighed curlew. From a global perspective, a 2008 assessment identified the coastline of the whole country as an Important Bird Area as habitat used by the curlew on migration (Birdlife International 2008). However, it only visits in small numbers so no specific actions can be taken in Tuvalu for its overall protection. The bird species important to Tuvaluans are different, primarily seabirds such as noddies that are valued as a traditional food source and for guiding fishermen to schooling fish such as skipjack tuna.

Several species of indigenous plants are identified as rare, possibly extinct, including coastal shrubs and woody herbs (Thaman et al. 2012). However, none are currently considered of sufficient importance to require conservation programmes.

There is a lack of information on various groups that needs to be addressed by systematic surveys. A list developed through discussion with communities during the BIORAPs within the R2R project (Thaman et al. 2018b) is presented in table 10.

1. **IAS: Invasive alien species:** with possible priority species including rats, ants, noxious weeds, food crop diseases, coastal plant diseases and marine algae and cyanobacteria.
2. **Sea Birds:** Sea bird populations on uninhabited atolls that have only been inventoried in detail in the 1994 in the Funafuti conservation area, but which constitute an important food source, navigation and fish-finding guides for Tuvaluan fishermen, provide important links and ecological services in the RTR marine-atoll link and critical niche ecotourism activities. Associated with this survey would be a component to assess the threat posed by rats, ants and other IAS, drought and habitat loss on existing bird populations.
3. **Crabs:** Particularly threatened are a number of crabs, including the coconut crab (uu), a number of overexploited land and shore crabs (kaipea, kaviki), hermit crabs (uga) and selected reef crabs.
4. **Molluscs:** Land snails (misa) and other target marine molluscs (pule, pu, kalea, alili, fasua, etc.) that are of central importance to Tuvalu's main export and local handicraft trade, the sustainability of which is critical.
5. **Reptiles:** Possibly reptiles, e.g., geckos and skinks (moko and pili) that may be negatively affected by habitat loss, indiscriminate burning, pigs, ants and other invasive species, and which may be good indicators of the overall health of atoll islands; and sea turtles, with specific focus on the health of turtle nesting areas on uninhabited islets;

6. **Schooling and Aggregating fish:** Some schooling and small school fish, the massive spawning aggregations of which seen to have historically declined dramatically. These could include maiava (Siganus argenteus); schooling goatfishes (Mullidae), kalo, malili and vete (Mulloidichthys spp.); small trevallys and scads (Carangidae), including bigeye scad, salala (Selar crumenophthalmus) and yellowtail scad, atule (Atule mate); and large aggregating groupers, fāpuku, feata, munua (Epinephelus spp.) and coral trout, tonu, tonu pula (Cephalopholis spp.). .

7. **Coastal Trees and Plants:** Important coastal trees, including mangroves, and other indigenous coastal plants that are in need of protection, propagation and replanting, with the assistance of a mass propagation scheme to allow for coastal rehabilitation and reinforcement.

8. Soil enrichment and mulching plants: Protection and restoration, including propagation of plants vital to the maintenance and improve soil fertility and for making mulch (kaiao) in the extremely poor soils of the atolls.

9. Food plant cultivars: Important food plant cultivars that are central to food security in Tuvalu and that need to be enriched and planted. There is a need to assess the need for and ways to propagate key food species.

10. Medicinal Plants: Many medicinal plants, which are critical to health and cultural security are now reportedly threatened or in short supply.

Table 10: Priority species or taxa for further in-depth biodiversity surveys or re-surveys based on the results of the R2R BIORAPs after comparison with findings of past studies of marine and terrestrial biodiversity.

Turtles

A detailed review of turtle conservation identified the following actions (Tekinene 2010):

- Develop specific legislation for turtle conservation
- Strengthening of traditional rules through development of by-laws on each island.
- Increase public awareness on turtle management and conservation.
- Prohibit certain fishing methods (e.g., spear and net) that may cause severe damaging or injuries to turtles that escape.
- Prohibit dumping of plastics into the sea and develop a specific regulation to properly managed disposal of plastics.
- Prohibit or highly regulate sale of turtle meat.
- Enforce conservation measures through Government Institutions, Kaupule and individual communities working collaboratively.
- Establish a Marine Sanctuary Management Plan to strengthen the implementation of turtle management and conservation.
- Declare Niulakita as a Tuvalu Turtle Sanctuary.

In addition, Nanumea Kaupule has proposed to extend the boundary of their current CA towards the islet of Lakena which will be earmarked as a reserve for the protection of turtles.

Sharks

Surveys and discussions with local fishermen have identified that reef shark stocks are currently very low around Tuvalu, maybe through fisheries targeting sharks and through by-catch of fisheries targeting other fish (Job & Ceccarelli 2012). Table 2 identified 15 threatened shark species in Tuvaluan waters of which five are 'vulnerable' and thus closer to extinction including four pelagic species that may be taken

as by-catch. Education programs are needed to cover the importance of sharks as a top predator to maintain a healthy ecosystem, along with possibly the imposition of catch limits and banning the finning of sharks as first steps.

Medicinal plants

The Department of Environment is investigating ways to document the traditional knowledge associated with plants to identify any that require breeding programmes.

Agri-biodiversity

It has been identified that some agricultural ecosystems, particularly swamp taro gardens, and cultivars of taro, breadfruit, pandanus and banana are under threat.

Objective	Actions	Targets	Means of Verification	Responsibility	Financing
Obtain information needed to endure the conservation of different groups	Conduct surveys on priority groups from the list identified for the R2R project and the community assessment carried out within the recent BIORAP	To conduct at least 2 monitoring surveys on bio indicators identified in the bio rap for each island (annually).	Monitoring Report	DoE	R2R
Conserve turtles	Implement the recommendations of Tekinene (2010) detailed in the theme introduction.	To implement at least the most effective recommendation in the conservation of turtles.	Recommendation Report	DoE, Kaupule	R2R, Kaupule
Conserve sharks	Develop education and awareness programmes on the importance of sharks to healthy ecosystems Support regional measures to reduce by-catch of oceanic sharks by tuna fisheries	To conduct at least twice a year awareness program on each island and a monthly radio awareness program. To Align national policies and plans to regional measure on the conservation of sharks	Awareness Report Policies and Plans aligned to regional measures	TFD, DoE	TFD, DoE

Conserve sharks	Assess opportunities to impose catch limits on sharks in coastal fisheries Take measures to prevent catching of sharks for finning	To setup programs to assess opportunities in imposing catch limits of sharks To create measures in the prevention of catching of sharks for finning	List of measures in the prevention of catching sharks	TFD, DoE	TFD, DoE
Conserve rare medicinal plants	Identify medicinal plants in need of conservation action Establish management programmes for those species	To conserve at least the most needed medicinal plants on each island To establish management programs of the conservation of medicinal plants in yearly plans of the Kaupule	Conservation Report on the high priority plant to conserve Management Programs	DoE, DoC	DoE, DoC
Conservation of agri-biodiversity	Encourage the continued use of pit gardens (pela) for swamp taro Set up programmes to conserve cultivars of taro, breadfruit, pandanus and banana	To provide at least 50 pit gardens for swamp taro on those islands are in need of these idea. To continue the planting of breadfruit, pandanus, banana and taro on the island.	Activity Report on Planting trees	DoA	DoA

6.3 THEME 3: Sustainable use of natural resources

There is evidence of over-harvesting in of marine resources and seabirds that this theme aims to address.

Coastal fisheries

Coastal marine resources (fish and invertebrates) are utilised as part of traditional subsistence and by small-scale operators who sell their catch.

Alefaio et al. (2016) reports on the analysis of creel surveys (based on interviews and data from fishermen) carried out on six atolls that showed that coastal fisheries were overfished, particularly in Funafuti. 60% of studied fish species had half or more of the catch below the size at maturity – i.e. they had been caught before they could breed. The main fish showing this were acanthurids (pone), carangids (ulua, kamai), serranids (gatala), lethrinids (noto) and lutjanids (taea).

They made the following recommendations to relieve pressure on coastal fisheries:

- Mechanisms to deflect some of the fishing effort offshore to target tuna should be investigated, coupled with greater efforts on sea safety – particularly on the outer islands
- Awareness is needed on the survey results to begin a management dialogue.

They also identified the need to extend surveys to better target outer islands and include gleaning for invertebrates, collect GPS data, and obtain more 'size at maturity' data.

Job & Ceccarelli 2012 suggested that a customary management committee should be set up on each atoll involving community representatives (elders, women, youth, local and commercial fishers) to look after marine monitoring and set up management plans according to changes in stocks. It would also be responsible for disseminating information about the state of marine resources within the local community and could raise its own funds to cover fieldwork, communication, etc., as has already been done in Nukulaelae (GEF fund under the World Bank).

The Funafuti and Outer Islands BIORAPs (Thaman et al. 2018a, 2018b) identified the large number of marine organisms know to and used by communities. Many were identified to be threatened or in short supply.

Ciguatera poisoning
Ciguatera is a widespread form of food poisoning linked to human consumption of fish from coral reefs that has a significant impact on coastal fisheries. An outbreak on Niutao in the past was one of worst worldwide. Socioeconomic impacts of ciguatera in endemic areas are substantial,

Ciguatera poisoning is caused by the consumption of reef fishes contaminated with neurotoxins produced by dinoflagellates which live on the surfaces of macro-algae and detritus on dead corals. These toxins accumulate through the food chain and reach the highest levels in carnivorous fishes, many of which are commonly targeted in reef fisheries. The toxin does not generally kill the fish but there is evidence that it may change behaviour and adversely affect developing embryos. So, while ciguatera can assist in the conservation of fish stocks by discouraging people from targeting certain fish species, it might also have some effect on the survival and reproductive success of reef fishes and thus alter ecosystem community structure. The environmental conditions leading to increases in ciguatera are not fully understood, but include seawater temperature increases and environmental disturbances, e.g., events causing massive coral mortality, such as reef dredging, bleaching, and hurricanes. Ciguatera can thus be an indicator of coral reef health and be used to detect and/or assess environmental disturbances to reefs (Richlen et al. 2012).

Objective	Actions	Targets	Means of Verification	Responsibility	Financing
Develop sustainable inshore fisheries	Implement, enforce, and monitor the implementation of marine conservation techniques piloted across the 9 islands Set up and strengthen a customary management committee on each atoll	Management & Monitoring plans established for all islands by end of 2018. (All islands). To formalized a LMMA network	Management and Monitoring Plans	DoE	R2R
	Reduce fishing effort in short-term by introduction of size limits for as many harvested species as possible, and ban fishing of spawning aggregations. Form bylaws or other controls to support these measures Promote compliance with fishing controls among its members	To establish national fishing size limits for the harvested species in Tuvalu To establish bye-law for the protection of fishes during spawning season To encourage all member to comply with all the decided fishing controls.	Fish Size Limit Recommendation Report Bye-laws	Kaupule, TFD Kaupule FOFA	FRFSP
	Monitor incidence of ciguatera poisoning in relation to fisheries and coral reef health	To collect enough information on ciguatera poisoning in relation to fisheries and the health of coral reef	Ciguatera Report	TFD	FRFSP

Complete baseline surveys	Carry out baseline marine surveys on atolls not adequately covered to date	To conduct a scientific marine survey on all island to confirm the status of marine biodiversity of each island.	Scientific Report	TFD	R2R
Undertake monitoring	Carry out monitoring at prescribed sites including LMMA's to document change against baselines	To collect information to inform the status of monitoring sites which include LMMAs.	Monitoring Report	TFD	R2R, Kaupule, TFD

Seabirds

Overharvesting has been identified as an issue for seabirds harvested for food, including within the Funafuti Marine Conservation Area. In the past, traditional practices include measures to ensure sustainability, such as a Niutao bird harvesting rule that involved climbing up a tree and if too few birds were counted in it – stopping. Now the take of birds is increased through the use of motor boats to access atolls, and shotguns.

Objective	Actions	Targets	Means of Verification	Responsibility	Financing
Ensure that any seabird harvest is sustainable	Carry out baseline surveys of nesting seabirds on all atolls. Establish sustainable harvest levels of priority populations. Work with communities to agree management regimes	To conduct and identify seabirds and their nesting sites on selected islands. Conduct a feasible study on seabird population and harvesting levels.	Seabird Survey Report	DoE, Kaupule, island communities	R2R, TFD

Offshore fishery

Tuvalu's offshore fishery is largely managed through the country's involvement as a Party to the Nauru Agreement (PNA), a sub-regional agreement between Tuvalu, the Federated States of Micronesia, Kiribati, the Marshall Islands, Nauru, Palau, Papua New Guinea, and Solomon Islands Concerning Cooperation in the Management of Fisheries of Common Interest. PNA has been a champion for marine conservation and management, taking unilateral action to conserve overfished bigeye tuna in the Western and Central Pacific Ocean, including closures of high seas pockets, seasonal bans on use of Fish Aggregating Devices (FAD), satellite tracking of boats, in port trans-shipment, 100 percent observer coverage of purse seiners, closed areas for conservation, mesh size regulations, tuna catch retention requirements, hard limits on fishing effort, prohibitions against targeting whale sharks, shark action plans, and other conservation measures to protect the marine ecosystem.

At their 2017 meeting, PNA Ministers expressed concern about the overfished status of bigeye tuna, which is important for the longline fishery, and called for the adoption of measures at the WCPFC meeting later this year to rebuild the stock within ten years. A stock report on skipjack tuna, the primary target species for purse seiners, showed that this important stock is being fished at sustainable levels. Reports on trends in tuna catches in PNA waters confirmed that the Vessel Days Management Scheme is effectively controlling the number of purse seine vessels while promoting growth in domestic fleets.

The Funafuti Reef Fisheries Stewardship Plan sets out a strategy to increase the fishing focus on offshore pelagic species such as tunas to reduce fishing pressure inshore and maximise the benefits of such fishing.

Objective	Actions	Targets	Means of Verification	Responsibility	Financing
Increase the fishing of offshore pelagic species	Improve availability and types of fish aggregating devices (FADs)	To improve the access of fishermen to fishes in order to supply enough food supply for the island community.	FAD Installed	TFD	TFD
	Increase boat safety & develop a national search & rescue plan	To improve boat safety through national search and rescue plan	Search & Rescue Plan	TFD	TFD

Objective	Actions	Targets	Means of Verification	Responsibility	Financing
Increase the fishing of offshore pelagic species	Develop Offshore Fisheries Development Project to introduce larger, more seaworthy fishing boats	Undertake feasibility study	Feasibility Study Report	TFD	FAO
Investigate use of transhipment fish in Funafuti	Investigate options such as converting fish waste into pig and chicken food, or establishing micro-cannery	To conduct research on the conversion of fish waste into pig and chicken food.	Research Report on conversion of fish waste into pig and chicken food	TFD	TFD

6.4 THEME 4: Management of Invasive Species

Tuvalu has been relatively successful at avoiding some of the worst invasive species present in the region, but the threat is increasing and the country has recognised this and is organising a significant response. In 2015 the Department of Environment formed and coordinated the Tuvalu Invasive Species Committee which include the Department of Agriculture and the Marine and Port Services Department. Then in 2016 it signed up to participate in a GEF Full-sized Project entitled: 'Strengthening national and regional capacities to reduce the impact of Invasive Alien Species on globally significant biodiversity in the Pacific' alongside three other countries: Tonga, Niue and Marshall Islands, implemented by UNDP, SPREP and SPC. This will allow the development of a comprehensive programme to tackle invasive species at all levels from creating the necessary institutional and policy framework through to enhanced border control and the management of invasive species already present. A Biosecurity Act was enacted in 2017.

The Funafuti BIORAP (Thaman et al. 2018) identified the most serious weeds there as probably mohuku solo (metilia), which can refer to both Wedelia or trailing daisy (Sphagneticola trilobata) or dayflower (Commelina diffusa); and mouku matiotio, sensitive plant; and mouku talatala, bur grass, both of which have sharp thorns or burs, the latter of which gets stuck in clothing or in the fur of cats and dogs; saketa, beach pea; and muta, nutsedge, which are both serious garden weeds that reportedly overrun gardens; and trees such as papaya, coconut and breadfruit, the roots of which damage water cisterns and spoil gardens. The most serious animal pests were black rats (kimoa, the general name for rats); yellow crazy ants (lō kula or lō makalokalo, loo makinikini) and a number of caterpillars or insect larvae (anufe). As an

example of an insect pest, the kou leafworm, a caterpillar of an introduced moth (Ethmia nigroapicella), defoliated many kanava trees along the lagoon coast of Nanumea in 2010 and the pest has spread rapidly to other atolls. In terms of marine invasive species, a non-native seaweed (Sargassum polycystum) has been spreading rapidly in Fogafale lagoon since 2011.

This NBSAP outlines a preliminary plan of action within this theme. More detail will be added in 2018 through one of the first activities under the GEF-UNEP project: the development of a National Invasive Species Strategy & Action Plan (NISSAP).

Tuvalu is placing some emphasis on marine invasive species and a National Ballast Water Management Strategy is planned. Border control should be enhanced and a Biosecurity Bill is under development. Existing invasive species that need tackling include yellow crazy ants, fruit flies, rats, invertebrate pests and diseases threatening agricultural crops, and weeds.

Target:

Aichi Target 9 is by 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Objective	Actions	Targets	Means of Verification	Responsibility	Financing
Strengthen institutional frameworks and capacities for IAS management	Cross-sectoral and gender-balanced IAS technical advisory group established Strengthened IAS legislation, regulations and policies in place finalise a National Ballast Water Management Strategy National Invasive Species Strategy & Action Plan (NISSAP) developed and implemented	To establish a representative of men and women for an IAS Advisory Committee To keep the country safe from Invasive species entering the country water and lands. To enhance the implementation of related activities Invasive species in Tuvalu.	IAS Advisory Committee Established Regulation and Precaution Measures for Invasive Species developed Implementation Plan	DoA, DoE	DoA
Establish national system for prioritizing IAS management	Baseline studies of the distribution and status of invasive species, and programme for detecting change. Effective protocols for assessing risk and prioritising IAS for management developed	To conduct a baseline study to collect information on the status and distribution on invasive species in Tuvalu To establish effective protocol for assessing risk from IAS.	Baseline Study Report	DoE, DoA	DoE, DoA
Strength border control on Funafuti	Provide boarder control unit with better equipment for control IAS entering the country	To procure proper equipment for boarder control unit for controlling IAS from entering the country.	Proper equipment procured	DoE, DoA	DoE, DoA, Marine

Implementing programmes for IAS risk	Early Detection & Rapid Response plan & protocols operational	To develop an early detection and rapid response plan and protocol operational for IAS in Tuvalu.	Early detection and rapid response plan	DoE	DoE
Reduction, Early Detection and Rapid Response (EDRR), eradication, control and restoration	Sustainable IAS control programme(s) established targeting the following: - Yellow-crazy ants - Rats - Insect pests of food crops e.g., coconut scale insect, fruit flies - Kou leaf-worm – pest of kanava coastal tree	To establish sustainable control program for IAS for the following: - Yellow-crazy ants - Rats - Insect pests of food crops e.g., coconut scale insect, fruit flies - Kou leaf-worm – pest of kanava coastal tree - Cane Toads	Control Program for IAS	DoE, DoA	DoE
	Successful eradications of priority species completed on islands	To establish a program for the eradications of priority species on each island.	IAS Eradication Program	DoE, DoA, Marine	IAS Project

6.5 THEME 5: Management of Traditional Knowledge and Equitable Sharing of Benefits and Access to Biodiversity

The actions in this theme are largely reproduced from the country's first NBSAP, as work on these was not completed during the intervening period, and the National Policy on Culture. This policy includes strategies for the thematic areas of Culture and Environment and Culture, Traditional Knowledge and Legal Protection (Govt. of Tuvalu 2015). Several focus on implementing two Model Laws were developed in 2002 within a Pacific Regional Framework for the Protection of Traditional Knowledge and Expressions of Culture. One covers the protection of traditional knowledge and expressions of culture developed by SPC, PIFS and UNESCO and the other covering Traditional Biological Knowledge, Innovation and Practices developed in consultation with SPREP.

Loss of knowledge about the names, importance and conservation status of threatened marine life, plants and animals is a major concern.

Without this knowledge, and with declining use of traditional foods provided by native biodiversity, its conservation becomes very difficult. Most names of plants, birds, fishes, crabs, shellfish, etc. are not known to the current generation (Thaman et al. 2018b).
Access to genetic resources and equitable sharing of benefits are covered by the Nagoya Protocol (see Box) to which Tuvalu has acceded in 2018.

The Department of Environment is working closely with SPREP's ABS team through a regional project to develop a policy for Tuvalu to implement the Nagoya Protocol.

Awareness raising on the issue has been carried out for all Government Secretaries and relevant stakeholders. The main aim of this is to ensure the fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge.

Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity.

The Nagoya Protocol is a supplementary agreement to the Convention on Biological Diversity. It provides a transparent legal framework for the effective implementation of one of the three objectives of the CBD: the fair and equitable sharing of benefits arising out of the utilization of genetic resources. This in turn should contribute to the conservation and sustainable use of biodiversity. The Protocol was adopted in 2010 in Nagoya, Japan and entered into force in 2014.

Targets:
Aichi Target 16 is by 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Aichi Target 18 is by 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Objective	Actions	Targets	Means of Verification	Responsibility	Financing
Protect and encourage the use of traditional knowledge in managing natural resources	Foster and promote the use of traditional knowledge and cultural practices in the conservation and management of biodiversity in Tuvalu Finalise and implement Model Laws to document and preserve traditional knowledge related to biodiversity conservation Develop education and training programmes to advance understanding of value of traditional knowledge	To encourage the use of traditional knowledge and culture practices on the conservation of island biodiversity of Tuvalu. To establish a model to document and preserve traditional knowledge related to biodiversity conservation. To raise awareness on the understanding value of traditional knowledge.	Traditional Knowledge Preservation Model Awareness Report	Culture, DoE	DoE
Foster and promote the equitable sharing of benefits derived from biodiversity	Develop an ABS policy for Tuvalu to implement the Nagoya Protocol. Implement ABS policy	To support the implementation of the Nagoya Protocol through the development of an ABS policy for Tuvalu.	Nagoya Protocol Implementation Plan	DoE, SPREP	DoE

Assist in the preservation of Tuvalu's historical and natural heritage sites	Secure listing of Tuvalu as a party to the UNESCO World Heritage Convention and other UNESCO conventions addressing the protection of natural and cultural resources Conduct surveys of historical and natural heritage sites	To continue participate in the UNESCO World Heritage Convention To identify historical and natural heritage sites.	Workshop Report Historical and natural heritage sites Report	DoE, DoC DoLS.	DoE, DoC

6.6 THEME 6: Climate change linked to biodiversity

Climate change (CC) issues are addressed as a national priority through a national policy, plan, and a National Advisory Council on CC which meets monthly focusing on adaptation and mitigation. A National Disaster Committee meets quarterly and links to individual Island Disaster Committees focuses on disaster mitigation, preparedness, response and recovery.

Current projects include NAPA II; Conference of the Parties of the UNFCCC and Paris Agreement; Tuvalu Survival Fund; Building Safety and Resilience (EU/SPC); Strengthening Water Security; and Coastal Adaptation (Green Climate Fund).

The NBSAP focusses on the interface between climate change and biodiversity conservation with two subject areas:

1. The potential negative impacts of climate change on biodiversity and how to mitigate this
2. Ecosystem-based adaptation – conserving and enhancing natural ecosystems for the role they play in adapting to climate change, particularly to sea level rise.

6.6.1 Impacts on biodiversity

A variety of impacts can be identified including the following:

- sea level rise and storm surges threatening coastal ecosystems and species
- ocean warming and acidification affecting on coral reefs
- changing rainfall patterns, droughts etc. affecting vegetation
- changing conditions allowing the spread of further invasive species

- risk of disaster responses leading to the introduction of new invasive species

6.6.2 Ecosystem-based adaptation

Adaptation strategies to sea level rise can be categorised as planned retreat, accommodation and protection. A two-dimensional approach to protection consisting of natural systems and artificial structures is more efficient than relying only on physical measures such as sea walls. Thus, the preservation of natural barriers such as mangroves, coral reefs and sandy beaches is critically important. Native plants that are adapted to drier and saline conditions should be promoted and grown extensively, e.g., te futu (Barringtonia asiatica) and fetau (Calophyllum inophyllum).

Objective	Actions	Targets	Means of Verification	Responsibility	Financing
Improve coastal protection from impacts of sea level rise and storm surges	Design both soft and hard coastal protection to protect biodiversity from sea level rise and storm surges. Assess the status of coastal areas in order to provide target solutions. Identify potential donors to fund coastal protection projects.	Protect Coastal Areas from sea level rise and storm surges Secure enough fundings for implementing coastal protection project.	Coastal Protection Design	TCAP, R2R, DoE	TCAP
Ensure protection of coral reefs from ocean acidification	Establish a coral nursery to grow super corals. Plant more super corals in order to withstand the impacts of ocean acidification. Provide more training to youth in planting super coral in affected areas.	Provide enough super corals to transplant to most affected areas on coral bleaching. Build capacity for interested youth on planting super corals.	Coral Nursery	R2R, Kaupule, CCD, DoE	R2R, Fuligafou

Increase awareness on the impacts of climate on Biodiversity	Develop training programs for Media personnel on impacts of climate change to Biodiversity. Develop a communication plan for the department on biodiversity. Develop knowledge products of impacts of climate change on Biodiversity.	Raise awareness of media personnel on climate change and its impacts on biodiversity. Produce at least few knowledge products on impact of climate change and made it available to the public.	Training Report Knowledge Products	R2R, TVBC, DoE	R2R, Fuligafou

6.7 THEME 7: Management of knowledge and information related to biodiversity

This theme addresses the management of information needed to appropriately conserve and make sustainable use of the country's biodiversity. It includes storing such information and making it available to decision-makers, managers and resource users to inform and guide their actions

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The R2R project has Knowledge Management as one of its four components with 12 actions.

Objective	**Actions**	**Targets**	**Means of Verification**	**Responsibility**	**Financing**
Improve Biodiversity Information System	Establishment of a GIS system to store information on Biodiversity	To Improve storing and accessing of biodiversity related information at all levels.	BIS and E-library developed	R2R & Environment, Library and Archives	R2R

Improve Biodiversity Information System	Establishment of a portal for storing biodiversity related information online. Developing a SOP for maintaining Biodiversity Information System. Support the development of a national e-library system for storing and accessing biodiversity related information anytime.	To Improve storing and accessing of biodiversity related information at all levels.	BIS and E-library developed	R2R & Environment, Library and Archives	R2R
Improve Knowledge Products on Biodiversity	Develop and disseminate arrays of knowledge about biodiversity. Create innovative ways of sharing information about island biodiversity to the public. Training of media personnel on biodiversity related issues. Establish and improved web-based products on biodiversity.	To develop at least 5 biodiversity knowledge-based products and be accessible by key stakeholders.	5 Biodiversity Knowledge Based Products	R2R & Environment, Library	R2R

Maintaining traditional knowledge on conserving biodiversity	Supporting national forum on updating information on traditional knowledge for conserving biodiversity. Document and storing traditional knowledge on the conservation of island biodiversity. Mainstreaming of Biodiversity topic into youth programs. Knowledge sharing at regional and international events.	To continue practice by locals our traditional knowledge on conserving biodiversity	Community Traditional Knowledge mainstreamed into Island Strategic Plan	R2R & Environment, Library	R2R

Target:

Aichi Target 19 is by 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

7. IMPLEMENTATION PLAN

Guidance from the Convention on Biological Diversity meetings is that countries include four implementation strategies in their revised NBSAP's tackling key issue of communication, mainstreaming, resourcing and capacity building, as below.

7.1 Communication & Outreach Strategy including Education

Communication Messages: The Twelve Commandments.
An outcome of the BIORAP's conducted by questionnaire in 2016 and 2017 was a "Twelve Commandments" for the Conservation of Atoll and Ocean Biodiversity and Ecosystem Services in Tuvalu. These are reproduced here as they represent a comprehensive list of the messages that can be utilised in communication programmes. The eleventh Commandment specifically covers education programmes.

1 PROTECT TREES, FORESTS AND COASTAL VEGETATION
Tree and Forest Management

- Trees and forests are the sign of healthy islands and the opposite of deserts and degraded lands
- All of Tuvalu's indigenous trees and plants are coastal plants adapted to drought and salty environments
- Tuvalu's inland, coastal, mangrove and village trees, plants and forests protect our islands, soils, beaches, animals and the lives of our people
- Trees are our most useful plants and trees and forests provide us with many goods and services
- Protect the wild plants and animals that depend on forests and tree
- Protect the seedlings of trees and other useful plants from destruction and fire
- Replant all trees that have died or been removed so that they will grow to replace older plants that have died
- Plant local foods, medicinal plants, fragrant and sacred plants (lakau manogi) and other useful plants in our villages and home gardens.
- Plant trees, hedges and windbreaks around our homes and food gardens to protect them from wind, salt spray, pests and stray animals.
- Have national and local atoll or village competitions the best tree gardens in or around villages
- Plant trees and other useful plants on all the reclaimed "Borrow Pits" and other reclaimed or cleared areas

2 USE MARINE RESOURCES WISELY
Fisheries Management

- Marine fish, shellfish and other animals are some of our most important sources of food and income
- Shells, shell necklaces and shell jewellery are very important exchange items and sources of cash income
- Many types of marine foods and shellfish are being overfished
- Sustainably harvest our fish, shellfish and other and marine resources – harvest only what you need.

- Discourage overfishing and destructive and illegal fishing practices such as gillnet fishing, use of scuba
- Do not harvest undersize fish and shellfish
- Protect spawning areas and fish migration paths
- Take your children fishing and teach them about our reefs, reef flats, lagoons, offshore islets and our marine animals and plants that remain important for our education, recreation and ecotourism.

3 CONSERVE AND DEVELOP FRESHWATER RESOURCES
Water Management and Conservation

- Fresh water is the most valuable and limited resource in Tuvalu
- Without water, plants, animals and people cannot survive and be healthy
- The only freshwater in Tuvalu is found as limited groundwater under the atoll islets and in our limited rain water catchment systems.
- Protect our groundwater/well water resources from overuse and pollution from sewage and waste to prevent waterborne diseases
- Develop and maintain roof and other improved rainwater catchment systems to maximise the collection and safe storage of rainwater
- Improve the efficient use of water for our people, animals and watering plants
- Drink more water and coconut juice and eat water rich fresh fruits and vegetables

4 CONSERVE SOIL AND SAND RESOURCES
Soil, Sand and Fire Management

(Soil conservation and fertility maintenance help in the recovery of the reclaimed borrow pits and the new “beaches”)
- Our limited soil and sand resources are required for the protection and health of trees, other plants and planting food plants.
- Promote fallow systems and fire management to improve the productivity of poor atoll soils
- Protect scarce topsoil, leaves, other plant remains to protect and improve our soils.
- Minimise unnecessary clearance of litter and plant remains,
- Stop indiscriminate burning and use of fire which destroys trees, leaves and other materials needed to protect and make good soils
- Use and improve traditional mulching and composting (kaiao) systems to improve and protect soils from the sun
- Protect and use our sand resources wisely so that our beaches do not erode

5 PROTECT AND IMPROVE AGRICULTURAL, FOOD AND HEALTH SYSTEMS
Agricultural, Food and Health Security

- Health is wealth and health is based on good food and nutrition and good health services
- Healthy people are the most important part of Tuvalu’s biodiversity
- Food, nutrition, health, energy and livelihood security is our first line of defence against climate change, natural disasters and non-communicable diseases. Healthy, well-nourished people live better and longer

- Tuvalu's traditional agricultural, food, drink and health systems are the best foundation for good nutrition and health and for the prevention of nutrition-related illnesses, such as diabetes, and the premature mortality of our most productive people.
- Teach your children to eat and drink fresh local foods and drinks
- Drink more water and coconut juice and eat more local foods that are rich in vitamins, minerals, water, fibre and protein and eat less imported foods and drinks that have too much sugar, salt and fat and which are one of the main causes of obesity and poor health
- Increase the consumption of safe clean water, especially by our children
- Insure that people drink safe uncontaminated water to prevent cholera and other waterborne diseases and medicinal and health practices
- Protect and plant food trees, food plants and other useful plants and protect and plant the different traditional varieties of all food and handicraft plants.
- Protect and improve traditional mulched taro gardens (pela)
- Use a combination of traditional mulching and compost systems to improve crop yields
- Breastfeed your children as long as possible. Mother's milk is the best food for babies,
- Raise farm animals around our homes and villages. Raise foods that are needed to keep them heathy. Make sure that we pen or tether our animals so that they do not destroy our crops and other valuable plants. Make sure that animal waste does not pollute or fresh water resources and lagoon
- Protect, replant and promote the appropriate use of medicinal plants to treat sickness and injury in humans and animals.
- Promote the improvement and raise awareness of the benefits of modern health services
- Promote nutrition-related health, sports and exercise and water and sea safety

6 PROMOTE AND IMPROVE TRADITIONAL ARTS, CRAFTS AND CONSTRUCTION
Conservation and Innovation of Material Culture

- Traditional arts and culture, including traditional handicrafts, construction, boatbuilding and woodcarving depend on the conservation of biodiversity (trees, plants, shellfish, etc.) for their production
- Many songs, dances, legends, etc. also feature in and help to preserve the knowledge about Tuvalu's biodiversity
- Promote the conservation, innovation and improvement of traditional house and fence construction, boatbuilding and woodcarving by combining traditional and new materials and designs
- Promote the conservation, innovation and improvement of traditional handicraft, weaving, arts, woodcarving etc. by combination of traditional materials and motifs new materials and motifs, e.g., the use of both traditional and modern materials for weaving and for dyes; the use of new materials and development of new designs for garlands and shell necklaces and jewellery
- Promote both traditional and modern sports and dancing, singing, swimming and exercise as central to the health of our people and culture.
- Promote ecocultural tourism (show tourists handicraft production, local crops, local medicine, local fishing techniques, local foods and sell and teach them about handicrafts

7 PREVENT AND CONTROL INVASIVE ALIEN SPECIES AND DISEASES
Biosecurity and Invasive Species Management

- Prevent the introduction, eradicate or control the spread of invasive alien species and diseases (such as weeds, ants, rats and plant diseases) on our islands before they kill, replace or degrade the plants, animals and places that protect us.
- Strengthen international, regional and local biosecurity and awareness of IAS.
- Activate the Tuvalu Invasive Species Committee that was established in 2015
- Develop a Tuvalu Invasive Species Action Plan that identifies and prioritizes existing and potential IAS threat to Tuvalu
- Use the best mix of traditional ways of pest and plant disease management and try to minimize the use of dangerous pesticide and when using them use them with correct protective equipment)
- Only use pesticides and herbicides as a last resort and teach people how to use and the dangers associated with pesticides use so they will use them safely

8 PREVENT AND REDUCE POLLUTION AND WASTE
Energy, Waste and Pollution Management

- Prevent, minimise and control all forms of air, land and water pollution and waste that affect our Tuvalu's islands, villages, freshwater resources and lagoons.
- Reduce the use of dangerous pesticides.
- Support and enforce an "Anti-Litter Decree" in Tuvalu.
- Don't smoke around children and others and reduce smoke pollution from cooking fires through the use of more efficient "smoke-free" ways of cooking and awareness.

9 PREPARE FOR CLIMATE CHANGE AND NATURAL DISASTERS
Disaster Risk Management and Planning

- Strengthen national and local disaster risk management and adaptation plans to prepare for and recover from climate change, sea-level rise and extreme events, such as drought, tropical cyclones and king tides through good preparation, protection, response and recovery strategies.
- Protect atoll, marine and village biodiversity as the first line of defence against and recovery from climate change, sea level-rise and extreme events, such as drought, tropical cyclones and king tides through good preparation, protection, response and recovery strategies
- Improve the quality construction of buildings, water catchment systems to build resilience

10 ESTABLISH A SYSTEM OF PROTECTED AREAS AND SPECIES
Conservation Area Development
- Establish and maintain protected (conservation) areas on our atoll islets and in our marine environment at the national, atoll and village levels.
- All landowners can protect and continue to use their biodiversity if we protect some inland forest, coastal forest, mangroves, reefs, important beaches or coastlines, uninhabited islands as conservation and resource-use zones
- Protect important uninhabited offshore islets (motu), remaining forest areas, mangroves, important reefs, reef passes and other areas where our plants and animals live, nest and reproduce.
- Establish national and island registers and Red Lists of threatened plants and animals
- Protect all of Tuvalu's threatened "Relisted" plants and animals that have been identified as needing some kind of protection.

- Designate and gazette important examples of threatened species on all atolls and develop a register of Tuvalu "Heritage Trees and Plants"

11 TEACH AND IMPROVE AWARENESS ABOUT BIODIVERSITY
Environmental Education and Awareness

- Develop educational and public awareness materials for use in schools and in public awareness campaigns to highlight the importance of biodiversity conservation as a basis for environmental, food, health and livelihood security in the face of global change
- Protect and teach traditional knowledge of the use and protection of our plants and animals that the older people in all of our communities have and which has protected our plants and animals in Tuvalu for thousands of years.
- Involve traditional leaders, craftsmen and knowledge holders, both men and women, in education and resource management.
- Teach our children the advantages of learning the knowledge and wisdom of older village men and women.
- Protect, honour, conserve, teach and use indigenous and local knowledge as a basis for building synergies with modern science as basis for sustainable conservation of Tuvalu's BES
- Use the media (press, radio, TV, videos, plays, Facebook, etc.) to spread messages about the importance of BES and BES conservation
- From the earliest age, teach our children about BES in our schools, in our homes, schools, churches, our government buildings and in our business houses, about the importance of BES as a foundation and bank account for economic and cultural development of Tuvalu.

12 SUPPORT GOOD GOVERNANCE AND PLAN FOR THE FUTURE
Environmental Governance and Planning

- Support, contribute to and obey plans, leadership and environmental laws and by-laws
- develop national and local plans to conserve BES.
- Help ensure that Tuvaluans of today do not destroy the healthy soil, sand, water, plants and animals that our parents and grandparents have left for us.
- Be honest and ethical. Don't be selfish. Use only what you need. Don't harvest too much, don't overfish. Think about future generations.
- Use wisely and protect Tuvalu's plants and animals and our atolls and marine environment so that our children and grandchildren and all future generations can satisfy their future needs for food, water, medicine, clothing, firewood, sacred and fragrant plants, education and housing. Help ensure that Tuvaluans of today do not destroy the healthy soil, sand, water, plants and animals that our parents and grandparents have left for us.
- Support local, national and international laws that protect our land and marine environments and plants and animals. These laws are for the benefit of everyone and for the benefit of the health of our planet Earth. Do not hunt or fish out of season. Do not catch and sell undersize fish and animals.
- Respect and support attempts to establish marine and terrestrial conservation areas. Do not cut mangrove and other trees illegally.
- Give your support to the Tuvalu government's attempts to support international actions to pro-

tect rare or endangered plants and animals, such as giant clams, coconut crabs and land crabs, coral, sea turtles, whales and seabirds.

- Obey village rules that protect plants and animals and the environment.

7.2 Mainstreaming Strategy

Lack of understanding at the government level has a significant impact on biodiversity conservation through the allocation of priority and financial resources to biodiversity conservation. Insufficient mainstreaming of the issue also remains a barrier. In recent years, environmental concerns have started to feature in the National Sustainable Development Strategies, and in fact sustainable development is part of TK-II. Despite this, integrated biodiversity management, Sustainable Land Management (SLM), Integrated Water Resource Management (IWRM) and Integrated Coastal Management (ICM) are not mainstreamed effectively into sector level strategies, business plans and importantly in island strategic plans (Source: R2R prodoc).

Mainstreaming of environmental issues has focused on IWRM and Climate Change. Tuvalu's IWRM project worked on mainstreaming IWRM into the Tuvalu National Water and Sanitation Policy. The NAPA I project focused on mainstreaming climate change into the agriculture sector and NAPA II project focuses on mainstreaming into marine resource management and Island Strategic Plans (ISPs). The "Building Resilience of Health Systems in Pacific Island LDCs to Climate Change" (Pacific CCH project) submitted to the LDCF plans to mainstream climate change into the health sector.
Mainstreaming of biodiversity conservation, ICM, and SLM has been limited. A focus on the environment is enhanced in the TK-III which has four strategic areas of direct relevance to this NBSAP. As a tool to integrate environmental considerations within development in Tuvalu, the Government endorsed the "Environmental Protection (EIA) Regulations 2014". Capacity to implement the new EIA system requires further development, in terms of staff numbers and knowledge, as well as awareness raising within relevant sector Ministries and island councils.

7.2.1 National Strategic Planning

[This section needs to identify the national process to produce Te Kakeega III and its successor and how the agencies responsible for biodiversity have input into that process.

7.2.2 Island Strategic Planning

Island strategic planning is based on two processes, the development of an Island Development Plans every 4 years and Business Plans every six months. Island Council meetings held [add frequency] provide an opportunity for biodiversity conservation issues to be raised and discussed.

Island Development Plans
Island 2-yearly Business Plans

- Funding, budgeting, reporting Island Council meetings
- Expert advice on issues
- Community to raise issues

7.3 Resource Mobilisation Strategy including financing

This section identifies possible sources of additional funding to address the necessary actions identified in this Strategy. The completed NBSAP should be circulated widely to all potential funders to identify how Tuvalu's needs may fit with their programmes and funding criteria.

7.3.1 External & internal sources of funds

External sources of funds
Multilateral Donors

- The Global Environment Facility (GEF)
- The Green Climate Fund (GCF)
- United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), Food & Agriculture Organization of the United Nations (FAO), United Nations Educational, Scientific and Cultural Organization (UNESCO)
- Secretariat of the Pacific Regional Environment Programme (SPREP), The Pacific Community (SPC).
- Strengthening the resilience of our islands and our communities to climate change (SRIC-CC)
- Other Treaty and Technical Organisations

Bilateral Donors

- NZAID
- DFAT
- Taiwan

International NGOs

- Worldwide Fund for Nature (WWF)
- Conservation International (CI)
- The Nature Conservancy (TNC)
- Birdlife international

Philanthropic Foundations and NGO's

- Alofa Tuvalu
- Tuvalu Overview
- Oceans Five
- Waitt Foundation
- TANGO
- Fuligafou

Mainly internal sources of funds

- Self-funding by private sector beneficiaries and other stakeholders
- Levies, taxes and penalties on users/ beneficiaries (user pays, beneficiary pays, polluter pays)
- developer contributions
- local donor/ philanthropic programs
- company sponsorships

- generating commercial revenue streams
- tax increment financing
- property lease-back arrangements
- local government funding from targeted rates and charges
- local government funding from broad-based revenue
- national government funding.

7.4 Capacity Development Strategy

A proper capacity development strategy is essential at all level in order for Tuvaluans to be able to tackle various biodiversity issues at the national and sub-national level. The department has been done capacity development through its projects but still there are gaps exist. Therefore, a need to conduct a biodiversity capacity need assessment at all level in order for training to target specifically to the issues that are deal with the people. This capacity need assessment needs to be focused on the decision makers, youth and schools.

The lack of capacity in building plans and policies that target the conservation of biodiversity is something that need to be strengthen at decision makers. Youth play a vital role in the conservation of biodiversity; however, they also need to build their capacity on technical skills that could be easily learn and practice for conserving of each island biodiversity. Future leaders need to be taught at early ages the importance of conserving biodiversity. The R2R Project introduce the Tuvalu in Young Hands Program which targeted the primary school students to build their capacity on environmental issues. This program has been trialled and need to be continued in order to offer opportunities for student at primary school ages to learn key knowledge and skills that are appropriate for student to look after the environment.

8. MONITORING AND REPORTING

8.1 Monitoring

The Monitoring of the NBSAP will be the responsibility of the Department of Environment and its key stakeholders.

8.2 Reporting

The reporting of the NBSAP will be used to inform the achievement of key indicators in the Te Kakeega III and the newly development plan of the government namely the Te Kete.

8.2.1 Te Kakeega III Indicators

Strategic Area 1: Climate Change

- Area of coastline reclaimed from erosion, cyclones and storm surge.
- Sea defences built in all islands of Tuvalu.

Strategic Area 8: Natural Resources

- Increase in fish stocks/coastal marine life for artisanal and semi-subsistent fishermen.
- Increase in quantity and quality of locally produced food for markets.
- Increase farmer productivity: traditional crops, vegetables, biodiversity food.

Strategic Area 10: Environment

- Increase afforestation and reforestation.
- Reduce degradation of natural habitats.
- Halt biodiversity loss, and protect/prevent extinction of threatened species.
- Increase financing to protect ecosystems, and for sustainable use of biodiversity.
- Invest annual budgetary savings in Tuvalu Survival Fund equal to 1% of GDP.
- Balance economic growth, social equity & env. protection in national planning.
- Conserve, restore and sustain use of terrestrial ecosystems

Strategic Area 12: Ocean & Seas

- Prevention and reduction of marine pollution, incl. marine debris, liquid waste, and nutrient pollution.
- Assessment of coastal fish stocks and marine life across Tuvalu, as baseline for measuring impact of protection and rejuvenation measures.
- Conserve at least 10% of coastal and marine areas, consistent with international law, based on the best scientific evidence.
- Access of small-scale artisanal fishers to marine resources and markets.

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ANNEX 1: Targets and indicators

This annex identifies biodiversity-related targets from a variety of sources.

A1.1 Aichi Targets

The CBD's Strategic Plan for Biodiversity 2011-2020 includes 20 headline targets for 2015 or 2020 (the "Aichi Biodiversity Targets"), organized under five strategic goals. The goals and targets comprise both: (i) aspirations for achievement at the global level; and (ii) a flexible framework for the establishment of national or regional targets. Progress towards each target is summarised below.

Strategic goal A. Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1: By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

Target 2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Target 3: By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions.

Target 4: By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Strategic goal B. Reduce the direct pressures on biodiversity and promote sustainable use

Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Target 6: By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Strategic goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 11: By 2020, at least 17 per cent of terrestrial and inland water areas, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Strategic goal D: Enhance the benefits to all from biodiversity and ecosystem services

Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Strategic goal E. Enhance implementation through participatory planning, knowledge man-

agement and capacity building

Target 17: By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Target 20: By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.

A1.2 Millennium Development Goals (MDGs)

These were the eight international development goals for the year 2015 established following the Millennium Summit of the United Nations in 2000.

Goal 7 is directly relevant to the NBSAP: 'To ensure environmental sustainability'.

A1.3 Sustainable Development Goals

The SDGs is a set of 17 "Global Goals" with 169 targets between them contained in paragraph 54 United Nations Resolution A/RES/70/1 of September 2015 that act as the successor to the Millennium Development Goals. Several goals are relevant to the NBSAP and they are set out below together with targets and indicators.

Goal 6 Ensure availability and sustainable management of water and sanitation for all.

Target 6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

Indicator 6.6.1 Change in wetlands extent over time (% change over time)

Goal 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Goal 14 Conserve and sustainably use the oceans, seas and mari

Target 14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

Indicator 14.1.1 Fertilizer consumption (kg/ha of arable land)
Indicator 14.1.2 Metric tonnes per year of plastic materials entering the ocean from all sources

Target 14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans
Description Rating*
Indicator 14.2.1 Percentage of coastline with formulated and adopted ICM/MSP plans
Indicator 14.2.2 Ocean Health Index CBB

Target 14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels

Indicator 14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations
Indicator 14.3.2 Coral coverage
Target 14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics

Indicator 14.4.1 Fish species, threatened
Indicator 14.4.2 Proportion of fish stocks within biologically sustainable limits

Target 14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information

Indicator 14.5.1 Percentage area of each country's EEZ in MPA. Percentage area of ABNJ in MPA Percentage area of global ocean under MPA
Indicator 14.5.2 Coverage of protected areas

Target 14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation

Indicator 14.6.1 Dollar value of negative fishery subsidies against 2015 baseline CBB
Indicator 14.6.2 Legal framework or tax/trade mechanisms prohibiting certain forms of fisheries subsidies

Target 14.7 By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism

Indicator 14.7.1 Fisheries as a % of GDP
Indicator 14.7.2 Level of revenue generated from sustainable use of marine resources
l Description Rating*
Target 14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular Small Island Developing States and least developed countries

Indicator 14.a.1 Number of researchers working in this area
Indicator 14.a.2 Budget allocated to research in the field of marine technology
Target 14.b Provide access for small-scale artisanal fishers to marine resources and markets

Indicator 14.b.1 By 2030, X% of small scale fisheries certified as sustainable; Y% increase in market access for small scale fisheries
Indicator 14.b.2 By 2030, increase by X% the proportion of global fish catch from sustainably managed small scale fisheries
Target 14.c Ensure the full implementation of international law, as reflected in the United Nations Convention on the Law of the Sea for States parties thereto, including, where applicable, existing regional and international regimes for the conservation and sustainable use of oceans and their resources by their parties

Indicator 14.c.1 Adoption of a legal framework and number of associated court cases
Indicator 14.c.2 Number of countries implementing either legally or programmatically the provisions set out in regional seas protocols

Goal 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Target 15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

Indicator 15.1.1 Coverage of protected areas broken down by ecosystem type, including total area of forests in protected areas (thousands of hectares)
Indicator 15.1.2 Forest area as a percentage of total land area
Target 15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and increase afforestation and reforestation by [x] per cent globally

Indicator 15.2.1 Net forest emissions Description Rating*
Indicator 15.2.2 Forest cover under sustainable forest management

Target 15.3 By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world

Indicator 15.3.1 Trends in land degradation
Indicator 15.3.2 Area of land/soils under sustainable management

Target 15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development

Indicator 15.4.1 Coverage of protected areas
Indicator 15.4.2 Mountain Green Cover Index
Target 15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity, and, by 2020, protect and prevent the extinction of threatened species

Indicator 15.5.1 Red List Index
Indicator 15.5.2 Living Planet Index
Target 15.6 Ensure fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources

Indicator 15.6.1 Number of countries that have adopted legislative, administrative and policy frameworks for the implementation of the Nagoya Protocol
Indicator 15.6.2 Number of permits or their equivalents made available to the Access and Benefit-sharing Clearinghouse established under the Nagoya Protocol and number of Standard Material Transfer Agreements, as communicated to the Governing Body of the International Treaty
Target 15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products

Indicator 15.7.1 Red List Index for species in trade
Indicator 15.7.2 Ratio of indexed value of total CITES-listed wildlife seizures to indexed value of total CITES wild-sourced export permits issued.
Target 15.8 By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species

Indicator 15.8.1 Adoption of national legislation relevant to the prevention or control of invasive alien species
Indicator 15.8.2 Red List Index for birds showing trends driven by invasive alien species
Target 15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

Indicator 15.9.1 National programme on the measurement of values of biodiversity or on the implementation of the SEEA-EEA
Indicator 15.9.2 Number of national development plans and processes integrating biodiversity and ecosystem services values
Target 15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainable use biodiversity and ecosystems

Indicator 15.a.1 Official Development Assistance

Indicator 15.a.2 National incentive schemes that reward positive contribution to biodiversity and ecosystem services

Target 15.b Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation

Indicator 15.b.1 Public funding for sustainable forest management

Indicator 15.b.2 Forestry official development assistance and forestry FDI

Target 15.c Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities

Indicator 15.c.1 Ratio of indexed value of total CITES-listed wildlife seizures to indexed value of total CITES wild-sourced export permits issued

Indicator 15.c.2 Extent to which sustainable practices and management by women and men pastoralists, farmers, fishers, forest dwellers on common lands, including national and trans-national mobility, are legally protected and enhanced by policies and regulations