



**KINGDOM OF TONGA**  
**National Invasive Species**  
**Strategy and Action Plan**  
**2021–2027**







# Kingdom of Tonga National Invasive Species Strategy and Action Plan

2021–2027



**SPREP**  
Secretariat of the Pacific Regional  
Environment Programme



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SPREP's vision: *The Pacific environment, sustaining our livelihoods and natural heritage in harmony with our cultures.*

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# FOREWORD

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It gives me great pleasure, on behalf of the Government of the Kingdom of Tonga, to endorse this Strategy and Action Plan for the management of invasive species in the Kingdom of Tonga. *The National Invasive Species Strategy and Action Plan* (NISSAP) offers solutions to invasive species that are a priority to the people of Tonga.

The NISSAP is a tool aligned with *the Guidelines for Invasive Species Management in the Pacific* that identifies the strategy and key actions to effectively prevent, manage and reduce the impacts of invasive species to the environment, our economy, culture and health and well-being in Tonga.

The development of this revised NISSAP was coordinated by the Department of Environment of the Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications (MEIDECC) and builds upon the previous NISSAP (2013–2020). We are very thankful for the contributions of representatives of in-country governmental and non-governmental organisations as well as national and international experts who helped develop this revised plan.

Your government is very happy to present this new NISSAP to you. The key to our success is in the hands of every Tongan, to work together for the benefit of our beloved country.



Hon. Hu'akavameiliku

Prime Minister of Tonga



## KEY CONCEPTS

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<b>Biocontrol or biological control</b>	Controlling an invasive species by introducing a natural enemy, such as an insect or fungus, that specifically attacks the target species and does not attack other native or economically important species.
<b>Biodiversity</b>	The variety of living organisms on Earth, including the variability within and between species and within and between ecosystems.
<b>Biosecurity</b>	Preventing the spread of invasive species across international or internal borders.
<b>Containment</b>	Keeping an invasive or pest species within a defined area.
<b>Control</b>	Reducing the population of an invasive species (numbers and distribution).
<b>Ecosystem</b>	Plants, animals, and other organisms and the physical environment in which they live and interact with each other. Types of ecosystems with distinct characteristics include lagoons, forests, and grasslands.
<b>Ecosystem services</b>	All the benefits to people provided by the natural environment and from healthy ecosystems. Some of the benefits of healthy ecosystem function include natural pollination of crops, clean air and water, nutrient cycling, and food productivity. Ecosystem services are usually referred to within four categories: regulating, provisioning, cultural, and supporting services.
<b>Effective management</b>	Achieving operational success (for example, reducing the pest to defined levels) and desired outcomes (reduced impact and recovery of impacted values) of invasive species management.
<b>Emergency response</b>	<p>The differences between the terms emergency response, incursion response, and EDRR might not be obvious:</p> <p>Emergency response is a general term that describes an event that requires some immediate action to decrease the impact of the event. Ideally, that event has been planned for, but it is not exactly predictable, such as where a cyclone might make landfall.</p>
<b>Incursion response</b>	Incursion response is an emergency response where the event is the arrival of a harmful pest or invasive species.
<b>Early Detection and Rapid Response (EDRR)</b>	Early detection and rapid response plans also target invasive species or pests. EDRR requires similar actions as for emergency or incursion response but also includes prioritisation, surveillance (for early detection), and being actively prepared. Active preparedness is crucially important to acknowledge in the Pacific islands because remote locations and lack of locally available treatment products slow the ability to respond rapidly.
<b>Emergency response plan</b>	When targeting pests and diseases, usually referred to as an incursion response plan. An incursion response plan is an emergency response plan to deal with a newly detected invasive species, plant or animal disease or pest.
<b>Endemic species</b>	A native species that naturally occurs confined to a single specific country or area. Indigenous (native) species occur naturally in one or more places.
<b>Environmental Impact Assessment</b>	Evaluates the impact of development and other activities on the environment and puts in place actions to mitigate these environmental impacts.
<b>Environmental and social impact assessment</b>	In addition to assessing environmental impact, an ESIA evaluates potential impacts to people and puts in place mitigation actions.

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<b>Eradication</b>	The removal of every individual of an invasive species from a specific place. Eradication is only successful if every individual is removed.
<b>Introduced species</b>	Plants, animals, and other organisms taken beyond their natural range by people, deliberately or unintentionally.
<b>Invasive species</b>	Introduced species that become destructive to the environment or human interests; can also include some native species that proliferate and become destructive following environmental changes caused by human activities.
<b>Monitoring</b>	Programmes to detect change, such as change in the distribution of invasive species, the success of management projects, and so on.
<b>Movement control</b>	Placing restrictions on the movement of people, animals, plants, and goods to restrict the spread of an invasive species. See also containment.
<b>Native species</b>	Plants, animals, and other organisms that occur naturally on an island or in a specified area, having either evolved there or arrived without human intervention.
<b>Neonative species</b>	Neonative species are those that have expanded geographically beyond their native range and that now have established populations whose presence is due to human-induced changes of the biophysical environment but not because of direct movement by human agency, intentional or unintentional, or due to the creation of dispersal corridors, such as canals, roads, pipelines, or tunnels.
<b>Non-native species</b>	Non-native species are those species that have been introduced by people. Non-native species include both harmful (that is, invasive) and beneficial species.
<b>Pathway</b>	The means by which an invasive species can be transported.
<b>Pest</b>	A pest is an animal or plant that harms the environment directly or harms human interests in an environment (agriculture, people's health, and so on) — whether it is native or introduced. Any animal that is harmful, unwanted, or annoying.
<b>Precautionary principle</b>	As applied to invasive species, the precautionary principle holds that where there is not enough information to predict whether a species will become invasive or not, it should be assumed that it will have a damaging impact and action should be taken to stop it establishing or spreading. It should also be assumed based on international experience that any species imported with the intention of being kept in ponds, pens, or cages will eventually escape into the wild.
<b>Region</b>	When not otherwise qualified, means the Pacific Ocean, with specific reference to the island states and territories members of SPC and SPREP.
<b>Risk assessment</b>	Evaluation of the risk that a new introduced species will become invasive with damaging consequences; this evaluation is conducted prior to its introduction.
<b>Surveillance</b>	Monitoring to detect the arrival of new invasive species.
<b>Threatened species</b>	General term for species ranked by <u>IUCN</u> as Critically Endangered (CR), Endangered (EN), or Vulnerable (VU).

## ACRONYMS

<b>CABI</b>	Commonwealth Agricultural Bureaux International
<b>CBD</b>	Convention on Biodiversity
<b>CITES</b>	Convention on International Trade in Endangered Species of Wild Fauna and Flora
<b>DOE</b>	Department of Environment, MEIDECC, Kingdom of Tonga
<b>EDRR</b>	Early Detection and Rapid Response
<b>EIA</b>	Environmental Impact Assessment
<b>ERP</b>	Emergency Response Plan
<b>ESIA</b>	Environmental and Social Impact Assessment
<b>GBIF</b>	Global Biodiversity Information Framework
<b>GEF</b>	The Global Environment Facility
<b>GEF-PAS</b>	The Global Environment Facility Pacific Alliance for Sustainability
<b>GEF 6 RIP</b>	The Global Environment Facility Regional Invasives Project
<b>GISD</b>	Global Invasive Species Database (maintained by ISSG)
<b>GISIN</b>	Global Invasive Species Information Network
<b>HPWRA</b>	Hawai'i-Pacific Ecosystems at Risk
<b>IAS</b>	Invasive Alien Species
<b>IBA</b>	Important Bird Area of BirdLife International, recognising key sites for bird conservation
<b>IBPoW</b>	Island Biodiversity Programme of Work
<b>IS</b>	Invasive Species
<b>ISSG</b>	Invasive Species Specialist Group of the Species Survival Commission of the IUCN
<b>IUCN</b>	International Union for Conservation of Nature
<b>KBA</b>	Key Biodiversity Area, a key area for biodiversity survival, part of a global partnership
<b>KPI</b>	Key Performance Indicator
<b>MAFF</b>	Ministry of Agriculture, Food and Forests, Kingdom of Tonga
<b>MEIDECC</b>	Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications, Kingdom of Tonga
<b>MCTL</b>	Ministry of Commerce, Tourism and Labour, Kingdom of Tonga
<b>MISCCAP</b>	Managing Invasive Species for Climate Change Adaptation in the Pacific
<b>MLECCNR</b>	Ministry of Lands, Environment, Climate Change and Natural Resources, Kingdom of Tonga

<b>MOE</b>	Ministry of Education, Kingdom of Tonga
<b>MOF</b>	Ministry of Fisheries, Kingdom of Tonga
<b>MOI</b>	Ministry of Infrastructure, Kingdom of Tonga
<b>NBSAP</b>	National Biodiversity Strategy and Action Plan
<b>NEA</b>	National Executing Agency of the GEF 6 RIP
<b>NISSAP</b>	National Invasive Species Strategy and Action Plan
<b>PBIF</b>	Pacific Biodiversity Information Framework
<b>PestList (PLD)</b>	Pacific Islands PestList Database
<b>PIAT</b>	Pacific Invasive Ant Toolkit
<b>PIER</b>	Pacific Island Ecosystems at Risk – for plant risk assessment information
<b>PIF</b>	Pacific Islands Forum
<b>PILN</b>	Pacific Invasives Learning Network
<b>PIP</b>	Pacific Invasives Partnership
<b>PIRT</b>	Pacific Islands Roundtable for Nature Conservation
<b>PMBT</b>	Pacific Marine Biosecurity Toolkit
<b>Plant Pono</b>	Hawai'i-Pacific Ecosystems at Risk website for plant risk assessment information
<b>PoWPA</b>	Programme of Work on Protected Areas
<b>PRISMSS</b>	Pacific Regional Invasive Species Support Service. PRISMSS is a collaboration of leading organisations supporting invasive species management for biodiversity protection in the Pacific. PRISMSS currently provides technical support across five regional programmes for the Pacific region: Natural Enemies–Natural Solutions (NENS), Predator Free Pacific (PFP), Protect our Islands (POI), Resilient Ecosystems, Resilient Communities (RERC), War on Weeds (WOW)
<b>QQMD</b>	Quarantine and Quality Management Division of MAFF
<b>SPC</b>	(Secretariat of the) Pacific Community
<b>SPREP</b>	Secretariat of the Pacific Regional Environmental Programme
<b>SSC</b>	Species Survival Commission of IUCN
<b>UNEP</b>	United Nations Environment Programme
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>UNCCD</b>	United Nations Convention to Combat Desertification
<b>VEPA</b>	Vava'u Environmental Protection Association, a not-for-profit environmental organisation

## SPECIES REFERRED TO IN THE DOCUMENT

Species are present in Tonga unless otherwise indicated. Presence was initially derived from the ISSG list for Tonga (ISSG 2013) and reviewed during the NISSAP creation. The following list is a subset of the ISSG list.

ENGLISH NAME	COMMON NAME TONGA	SCIENTIFIC NAME	STATUS
<b>MICRO-ORGANISMS</b>			
Banana Bunchy Top Virus		<i>Banana Bunchy Top Virus</i> BBTV	invasive
Taro Leaf Blight		<i>Phytophthora colocasiae</i>	invasive
<b>PLANTS</b>			
A mahogany	<i>Langakali</i>	<i>Aglaia saltatorum</i>	native
A mahogany	<i>Langakalivao</i>	<i>Aglaia heterotricha</i>	endemic
Coral Vine		<i>Antigonon leptopus</i>	invasive
Mexican Poppy		<i>Argemone mexicana</i>	invasive (absent)
Giant Reed	<i>Kaho lalahi</i>	<i>Arundo donax</i>	invasive
Spanish Needle		<i>Bidens alba</i>	invasive (absent)
Spanish Needle	<i>Fisi'uli</i>	<i>Bidens pilosa</i>	invasive
Buffalo Grass		<i>Brachiaria mutica</i>	invasive <sup>1</sup>
Panama Rubber Tree		<i>Castilla elastica</i>	invasive <sup>2</sup>
Ironwood	<i>Toa</i>	<i>Casuarina equisetifolia</i>	invasive
Honolulu Rose		<i>Clerodendrum chinense</i>	invasive <sup>3</sup>
Pagoda Flower		<i>Clerodendrum paniculatum</i>	invasive <sup>4</sup>
Fireworks Tree		<i>Clerodendrum quadriloculare</i>	invasive <sup>2</sup>
Koster's Curse		<i>Clidemia hirta</i>	invasive
Ivy Gourd		<i>Coccinia grandis</i>	invasive
Coconut	<i>Niu</i>	<i>Cocos nucifera</i>	introduced
Taro	<i>Taro</i>	<i>Colocasia esculenta</i>	native
Benghal Dayflower		<i>Commelina benghalensis</i>	invasive
Spanish Elm	<i>Kotia</i>	<i>Cordia alliodora</i>	invasive
A cycad	<i>Longolongo</i>	<i>Cycas seemannii</i>	native
Merremia		<i>Decalobanthus peltatus</i> <sup>5</sup>	invasive
Air Potato		<i>Dioscorea bulbifera</i>	invasive
Elephant's Foot		<i>Elephantopus mollis</i>	invasive
Wild Moon Flower		<i>Ipomoea macrantha</i>	invasive (absent)
Lantana	<i>Talatala</i>	<i>Lantana camara</i>	invasive
Wild Tamarind	<i>Sialemohe</i>	<i>Leucaena leucocephala</i> <sup>6</sup>	invasive
Hawaiian Wood Rose		<i>Merremia tuberosa</i>	invasive
Mile-a-minute Weed		<i>Mikania micrantha</i>	invasive

ENGLISH NAME	COMMON NAME TONGA	SCIENTIFIC NAME	STATUS
<b>PLANTS</b>			
Giant Sensitive Plant	<i>Mateloi lalahi</i>	<i>Mimosa diplotricha (Mimosa invisa)</i>	invasive
Sensitive Plant	<i>Mateloi</i>	<i>Mimosa pudica</i>	invasive
Noni	<i>Nonu</i>	<i>Morinda citrifolia</i>	native
T-grass		<i>Paspalum conjugatum</i>	invasive (absent?)
Saltgrass		<i>Paspalum vaginatum</i>	invasive (absent?)
Stinking passionflower	<i>Vaine á e kuma</i>	<i>Passiflora foetida</i>	invasive <sup>6</sup>
False Kava		<i>Piper auritium</i>	invasive
Indian Pluchea		<i>Pluchea indica</i>	invasive
Tongan podocarp	<i>Uhiuhi</i>	<i>Podocarpus pallidus</i>	endemic
Kudzu	<i>Akataha</i>	<i>Pueraria montana</i>	invasive
Samoan Mangrove	<i>Tongolei</i>	<i>Rhizophora samoensis</i>	native
Java Bean		<i>Senna tora</i>	invasive
Arrow-leaf Sida		<i>Sida rhombifolia</i>	invasive
Turkeyberry	<i>Tisaipale</i>	<i>Solanum torvum</i>	invasive
African Tulip Tree	<i>Tiulipe vao</i>	<i>Spathodea campanulata</i>	invasive
Singapore Daisy / Wedelia	<i>Ate</i>	<i>Sphagneticola trilobata</i>	invasive
Rat-tail Dropseed		<i>Sporobolus fertilis</i>	invasive (absent) <sup>7</sup>
Trumpet Flower		<i>Tecoma stans</i>	invasive
<b>ANTS</b>			
Yellow Crazy Ant		<i>Anoplolepis gracilipes</i>	invasive
Bicoloured Trailing Ant		<i>Monomorium floricola</i>	invasive
Black Crazy Ant		<i>Paratrechina longicornis</i>	invasive
African Big-headed Ant		<i>Pheidole megacephala</i>	invasive
Red Imported Fire Ant		<i>Solenopsis invicta</i>	invasive (absent)
Ghost Ant		<i>Tapinoma melanocephalum</i>	invasive
White-footed House Ant		<i>Technomyrmex albipes</i>	invasive <sup>8</sup>
Fijian White-footed Ant		<i>Technomyrmex vitiensis</i>	invasive (absent)
Bicoloured Pennant Ant		<i>Tetramorium bicarinatum</i>	invasive <sup>9</sup>
Similar Groove-headed Ant		<i>Tetramorium simillimum</i>	invasive <sup>9</sup>
Singapore Ant		<i>Trichomyrmex destructor (Monomorium destructor)</i>	invasive <sup>10</sup>
Little Fire Ant		<i>Wasmannia auropunctata</i>	invasive (absent)

ENGLISH NAME	COMMON NAME TONGA	SCIENTIFIC NAME	STATUS
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### OTHER INSECTS/INVERTEBRATES

Giant African Snail	<i>ʻElii ʻuta ʻafilika</i>	<i>Achatina fulica</i>	invasive (absent)
Yellow-fever Mosquito		<i>Aedes aegypti</i>	invasive
Fruit flies	<i>Lango huhukia</i>	<i>Bactrocera</i> spp. (six species)	invasive
Sweet Potato Whitefly	<i>Lango hinehina</i>	<i>Bemisia tabaci</i>	invasive (absent)
Coconut Crab	<i>Uʻu</i>	<i>Birgus latro</i>	native
Coconut Hispine Beetle		<i>Brontispa longissima</i>	invasive
Southern House Mosquito		<i>Culex quinquefasciatus</i>	invasive
Pink Hibiscus Mealybug		<i>Maconellicoccus hirsutus</i>	invasive
German Wasp		<i>Vespula germanica</i>	invasive (absent)
Common Wasp		<i>Vespula vulgaris</i>	invasive (absent) <sup>11</sup>
Paper wasp species		<i>Polistes</i> spp.	invasive (absent)

### MARINE SPECIES

Crown-of-thorns Starfish	<i>Alamea</i>	<i>Acanthaster planci</i>	native
Giant (Humphead) Wrasse		<i>Cheilinus undulatus</i>	native
Mozambique Tilapia	<i>Lapila</i>	<i>Oreochromis mossambicus</i>	invasive
Giant Clam	<i>Vasuva</i>	<i>Tridacna</i> spp.	native

### REPTILES

Brown Tree Snake		<i>Boiga irregularis</i>	invasive (absent)
Lau Banded Iguana		<i>Brachylophus fasciatus</i>	likely introduced
Green Turtle	<i>Fonutu ʻakula</i>	<i>Chelonia mydas</i>	native
Olive Small-scaled Skink		<i>Emoia lawesi</i>	native
Hawksbill Turtle		<i>Eretmochelys imbricata</i>	native
Asian House Gecko		<i>Hemidactylus frenatus</i>	invasive
Plague Skink		<i>Lampropholis delicata</i>	invasive



ENGLISH NAME	COMMON NAME TONGA	SCIENTIFIC NAME	STATUS
<b>MAMMALS</b>			
Feral Dog		<i>Canis lupus familiaris</i>	invasive
Feral Goat		<i>Capra hircus</i>	invasive
A microbat	<i>Pekepeka</i>	<i>Emballonura semicaudata</i>	native
Feral House Cat		<i>Felis catus</i>	invasive
Indian Grey Mongoose		<i>Herpestes javanicus</i>	invasive (absent)
Humpback Whale		<i>Megaptera novaeangliae</i>	native
House Mouse	<i>Kuma fale</i>	<i>Mus musculus</i>	invasive
Pacific Flying Fox	<i>Peka</i>	<i>Pteropus tonganus</i>	native
Asian Rat		<i>Rattus tanezumi</i>	invasive (absent)
Black Rat/Ship Rat		<i>Rattus rattus</i>	invasive
Brown Rat/Norway Rat		<i>Rattus norvegicus</i>	invasive
Pacific Rat	<i>Kuma</i>	<i>Rattus exulans</i>	invasive
Feral Pig	<i>Puaka</i>	<i>Sus scrofa</i>	invasive
<b>BIRDS</b>			
Common Myna		<i>Acridotheres tristis</i>	invasive <sup>12</sup>
Jungle Myna		<i>Acridotheres fuscus</i>	introduced
Pacific Black Duck	<i>Toloa</i>	<i>Anas superciliosa</i>	native
Pacific Pigeon	<i>Lupe</i>	<i>Ducula pacifica</i>	native
Shy Ground-dove	<i>Tu</i>	<i>Gallicolumba stairi</i>	native
Red Jungle Fowl		<i>Gallus gallus</i>	introduced
Tongan Megapode	<i>Malau</i>	<i>Megapodius pritchardii</i>	endemic
Tongan Whistler	<i>Hengehenga</i>	<i>Pachycephala jacquinoti</i>	endemic
Phoenix Petrel		<i>Pterodroma alba</i>	native (non-breeding)
Many-coloured Fruit-dove	<i>Manuma'a Lafu</i>	<i>Ptilinopus perousii</i>	native
Red-vented Bulbul		<i>Pycnonotus cafer</i>	invasive
Starling		<i>Sturnus vulgaris</i>	invasive

1 Not present in the ISSG list but on the Manaaki Whenua list of weeds in Tonga

2 Not present in the ISSG list

3 Status listed as "unknown" in the ISSG list

4 Not present in the ISSG list, but *Clerodendrum buchananii* var. *fallax* (also known as Pagoda Flower) is listed as present

5 Formerly *Merremia peltata*

6 Reported as present; status to be confirmed

7 According to the ISSG list other *Sporobolus* spp. are either present or of unknown status

8 Absent from the ISSG list but listed as present (and native) by Atherton et al. (2015)

9 Absent from the ISSG list but listed as present by Atherton et al. (2015)

10 Reported as present according to the ISSG list but not confirmed

11 Vespidae wasps are reported as present in Vava'u (VEPA 2020) but absent from ISSG list

12 Reported in the ISSG list; to be confirmed



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**FIGURE 1: Map of Tonga (1989). Perry-Castañeda Library Map Collection. Courtesy of the University of Texas Libraries, The University of Texas at Austin.**

# 1. INTRODUCTION

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Biodiversity is a term that describes the number and diversity of the different plants, animals, and other living things within our environment. Biodiversity is a key factor in natural resilience to the impacts of environmental change. All species contribute to environmental resilience, including those that are naturally common and those that are rare.

Natural biological communities have evolved over thousands or millions of years and have resulted in adaptations to local conditions that make these species resilient to natural environmental change. This community of native species contributes to ecosystem functioning and together provides the ecosystem services that we rely on. These services include provisioning (such as food, fuel, raw materials, and medicines), regulating (such as provision of clean water and air, climate regulation and flood protection, waste decomposition, and biological pest and disease control), supporting (such as nutrient cycling), and cultural services (such as spiritual and heritage value, recreation, and science).

When ecosystems are disturbed or disrupted, due to habitat modification, overharvesting, or invasive species, their function is affected, the benefits they offer decline, and resilience to further change is reduced.

In this time of unprecedented global environmental change, protecting biodiversity is more important than ever to ensure we can retain the benefits of the natural world on which all our lives depend.

## 1.1. Introduction to Tonga

The Kingdom of Tonga is made up of approximately 170 islands covering 750 square kilometres and an Exclusive Economic Zone of over 650,000 square kilometres. Tonga's closest neighbours are Fiji to the west, Niue to the east, and Samoa and Wallis and Futuna to the north.

Tonga's islands are divided into three main groups: Vava'u, Ha'apai, and Tongatapu. The largest island, Tongatapu, is home to the capital city of Nuku'alofa and covers 257 square kilometres.

Although all of Tonga is vulnerable to the effects of climate change, low-lying islands are particularly at risk. Recent events, such as the 2022 eruption at Hunga Tonga-Hunga Ha'apai and the subsequent tsunami, show Tonga's environmental vulnerability.

### 1.1.1. History and population

Our oral tradition, along with archaeological evidence and pollen evidence (see Whistler 1992; Fall 2011), indicates a long history of settlement of the Tongan Islands, dating back to the Lapita period around 3,000 years ago. Earliest settlement and occupation were of peoples from New Caledonia in the west and possibly further north. In the last 1,500 years, the development of Tongan culture saw a diversification from mainly seafood diets (especially fish and turtles) to one that also included many forest foods and agriculture crops.

Oral tradition also records a long lineage of chieftains or kings dating back about 40 generations, or more than 1,000 years (Burley et al. 2012). During this time of unification, there

was a strong maritime focus and Tongan influence extended as far as Samoa, Hawai'i, eastern Polynesia, and west to Melanesia. The traditional vaka were fitted with triangular sails and capable of long-distance travel, and the Tongan *kalia* vaka reputedly carried up to 100 men.

Following first European contact in 1777, missionaries flooded the South Pacific, and this may have been a two-edged sword for Tonga, reducing intertribal conflict on the one hand but contributing to disease-related deaths on the other.

The population of Tonga population is around 105, 000 (World Bank 2020). Although 35 islands are inhabited, 70% of the population live on Tongatapu. Many other Tongans live overseas, mostly in New Zealand and Australia.

Uniquely among other island nations in the Pacific, Tonga has never been governed by a colonial power and is the only constitutional monarchy among the Pacific island countries.

### 1.1.2. Environment

Geologically the Tongan islands are of two general types. Most islands have a limestone base arising out of uplifted coral formations, while others are limestone overlaying a volcanic base and some active volcanoes.

The terrestrial ecosystems include indigenous forests which have been managed to provide fresh water, healthy soils, animal and plant foods, traditional medicines, fuel, building materials, and other resources and products essential for Tonga's economic and social well-being (NBSAP 2006). The centuries of connection with, and dependence on, these resources are challenged by degradation and loss of forest habitat as well as the arrival of invasive species.

Marine ecosystems are also diverse with key biodiversity habitats including healthy coral reefs, fish spawning and feeding sites, and Green Turtle breeding grounds (NBSAP 2006). As with terrestrial systems, Tonga aims to ensure all priority sites are sustainably managed.

Tonga has 41 sites that are designated as Protected Areas, Conservation Areas, or Valued sites (ISSG 2013). Some sites have specific designations, and others are areas of high biodiversity value (such as Key Biodiversity Areas, Endemic Bird Areas, or Important Bird Areas) (NBSAP 2006, NISSAP 2013). Priority sites are listed in Annex 3.

### 1.1.3. Economy

Tonga's economy is sustained largely by fisheries, tourism, and agriculture, and the viability of these are dependent on healthy terrestrial and/or marine ecosystems.

Agriculture contributes 30% to Tonga's Gross Domestic Product (GDP), and about two-thirds of total exports are agricultural products. The main crops include squash, coconuts, bananas, and vanilla beans. The country imports many food products, mainly from New Zealand. The industrial sector accounts for only 10% of GDP.

Tourism is another major contributor to the economy, and tourists value Tonga's pristine marine and terrestrial environments.

Tonga's Gross Domestic Product (GDP) was USD 455 million in 2017, with per capita GDP of USD 6,383<sup>1</sup>.

<sup>1</sup> Statistics from CIA Factbook (2021)

## 1.2. The significant threat of invasive species for Tonga

Invasive species cause harm across a wide range of human activities in Tonga, and Pacific Island environments, including:

### Food security

- reduced crop yields (both quantity and quality);
- food loss or damage in storage;
- suppression or removal of natural resources, such as land crabs and seabirds;
- impacts to reef health and productivity; and
- suppression of natural plant growth and regeneration.

### Health

- increased incidence of specific diseases;
- contamination of water supplies;
- greater dependence on imported processed food – Increased risk of non-communicable diseases; and
- injuries and deaths through bites, stings, and allergic reactions.

### Biodiversity

- impacts to ecosystem processes, such as pollination, seed dispersal, forest regeneration, nutrient cycles, and so on; and
- suppression and removal of native species.

### Climate change

- Disturbance to natural and human infrastructure provides opportunity for invasive species to spread;
- Increased intensity and frequency of extreme weather events may affect society's ability to respond to invasive species threats;
- Indigenous species are typically ill equipped to adapt to a changing climate. Invasive species may benefit from change.

### Culture

- lost resources leading to lost cultural practices; and
- changing societal roles.

### Geomorphological

- soil erosion; and
- suppressed reef building and land accretion.

### Infrastructure

- burrowing animals and roots of plants undermine roads and buildings; and
- animals nesting in electrical systems causing outages and fires.

Invasive species are a major global threat to biodiversity, and Pacific islands are particularly vulnerable due to their isolation and relatively recent human occupation. Native species often cannot cope with predation or competition from new arrivals. Tonga already suffers from the impact of invasive species that have arrived in the country. However, there are many more devastating species that are not present in Tonga but found in other countries of the region, and every effort needs to be made to prevent their arrival.

In 2004, the IUCN published a selection of '100 of the World's Worst Invasive Species' (Lowe et al. 2004). Tonga already has at least 21 of the species on this list, but there are many more that could be introduced if Tonga does not maintain strong border control.

## 1.2.1. Threats already within Tonga

A desktop survey listed 392 species that have been reported to be introduced into Tonga (ISSG 2013). Although not all these species will cause harm (in other words, be invasive), some carry a high risk. The current range of animal and plant pests found on Tonga threatens the survival of many native species.

Section 7 outlines current and past management programmes and Annex 1 outlines the priority invasive species within Tonga and their management.

### MAMMALS

If feral pigs and cats gained access to the sensitive breeding islands of threatened species, such as turtles and the Malau (*Megapodius pritchardii*), further declines are likely through habitat degradation and predation.

Rodents (three species of Kuma/rats [*Rattus* spp.] and mice [*Mus musculus*]) and feral cats (*Felis catus*) threaten the survival of common and threatened native birds as well as damaging forest growth and harming human health.

The reduction or removal of seabird populations by rats and cats has widespread effects on terrestrial and marine ecosystems because these species supply much-needed nutrients to forests and nearshore reefs (Graham et al. 2018).

Useful domestic animals can also cause harm if they are not controlled. Feral pigs (*Sus scrofa*) damage forests and plantations and feed on native invertebrates. Other domestic animals such as feral dogs (*Canis lupus familiaris*) are found in Tonga and can all cause harm to the environment and to people if they are out of control.

### ANTS AND OTHER INSECTS AND INVERTEBRATES

Tonga has 54 ant species, none of which are locally endemic (Gruber et al. 2017). Around 30 species are Indo-Pacific (regional) natives, 14 are introduced but not considered harmful, and ten species considered invasive in the Pacific. The invasive species include Yellow Crazy Ant (*Anoplolepis gracillipes*), Black Crazy Ant (*Paratrechina longicornis*), African Big-headed Ant (*Pheidole megacephala*), Ghost Ant (*Tapinoma melanocephalum*), and Tropical Fire Ant.

The Yellow Crazy Ant can reach high abundances that threaten birds already at risk, such as the Hengehenga (Tongan Whistler), and a wide variety of other species. Elsewhere, Yellow Crazy Ants threaten a wide range of species. While not at present of concern in Tonga, the ant is well known for its population explosions and impact on Christmas Island (Australia), where it has changed the entire forest community (O'Dowd et al. 2003), and it has been implicated in extinctions of native species. In Tokelau, it caused declines in 'U'u and reduced the reproductive success of White Tern (*Gygis alba*) (Gruber et al. 2018).

Other introduced insects of concern include Southern House Mosquito (*Culex quinquefasciatus*, a known carrier of Avian influenza) and the Yellow-fever Mosquito (*Aedes aegypti*). Several crop pests are also present, including fruit flies (*Bactrocera* spp.).

## PLANTS

Pest plants, or weeds, threaten native plants and forest quality and impact the agricultural sector, requiring the extensive use of expensive herbicides to control them. These herbicides may also have non-target effects. Of the 355 introduced plant species recorded in Tonga, 142 are classified as weeds. Some of these are already having major impacts, but others have severe impacts elsewhere that are under-appreciated, such as the Money Plant (*Epipremnum pinnatum* cv. 'Aureum' (*Scindapsus*)).

Priority weeds targeted for potential biocontrol in Tonga include Arrowleaf Sida (*Sida rhombifolia*), Java Bean (*Senna tora*), and Ivy gourd (*Coccinia grandis*).

## MARINE INVASIVES

No detailed surveys have been undertaken for marine invasives, but Mozambique Tilapia (*Oreochromis mossambicus*) is recorded as introduced (ISSG 2013). The native Crown-of-thorns Starfish (*Acanthaster planci*) sometimes experience outbreaks that cause harm to reef health.

## INTERACTIVE IMPACTS

Harm can be caused by multiple invasive species. The BirdLife fact Sheet for the endemic Hengehenga (*Pachycephala jacquiloti*) notes: "A varying set of non-native mammals occurs on each of the 16 islands of Vava'u, including Pacific Rat (*Rattus exulans*) and Black Rat (*R. rattus*) which are likely predators, and ungulates which over-browse native understorey vegetation. If deforestation outpaces forest regrowth, the population of *P. jacquiloti* will surely decline" (BirdLife 2021a).

Combination effects are also likely to harm the threatened Pekepeka (*Emballonura semicaudata*), if it is not already extinct, directly through predation by cats and rats and indirectly via rats reducing food sources (insects and nectar).

### 1.2.2. Impacts of invasive species in Tonga

Invasive species are already a major driver of biodiversity loss in Tonga. Over half of Tonga's bird species have become extinct since human arrival, to which invasive species have likely contributed (Koopman & Steadman 1995). Several of Tonga's surviving endemic plants, birds, and reptiles are at risk of extinction. Key concerns regarding invasive species noted by stakeholders in consultations included the damage caused by rats and insects to plantation crops and concerns about feral pigs and invasive plants.

### 1.2.3. Potential threats to Tonga

Tonga's key invasion pathways through trade are with Australia, Fiji, Hawai'i, and New Zealand. Yachts and fishing vessels arrive from multiple sources, each of which brings its own set of risks.

Several risk species are found in Fiji, Hawai'i, and Australia. These include Indian Grey Mongoose (*Herpestes javanicus*, from Hawai'i and Fiji – which has been intercepted in Tonga), Little Fire Ant (*Wasmannia auropunctata*) and wasps (Hawai'i and Queensland, Australia), Red Imported Fire Ant (*Solenopsis invicta*, Queensland, Australia), Giant African Snail (*Achatina fulica*, Hawai'i and Samoa), snakes and other reptiles (Hawai'i, Australia, Fiji), and many weed species (all sources).

The Grey Mongoose is of particular concern, with at least four recent incursions documented in the Pacific, including in Tonga.

Around 2010, over 2,000 yachts were visiting Tongan waters annually (NISSAP 2013). The sources of these yachts are undocumented, however, and more information is needed on their routes. This massive number of yachts is likely to include significant visits from invasive hot spots such as French Polynesia, United States territories, and potentially the Americas (including the Caribbean), so risk assessments are urgently needed.

Giant African Snail (*Achatina fulica*) is frequently intercepted in Fiji. As well as causing environmental impacts through herbivory on plants and competition with native snails, it is a vector of a parasitic nematode that can cause meningitis, a sometimes-fatal infection of the brain, in people.

The Brown Tree Snake (*Boiga irregularis*) is thought to have caused the extinction of 10 of Guam's 12 landbird species (Rodda and Savidge 2007). Imagine if Tonga similarly lost over 80% of its landbirds. Many other snakes occur in Pacific rim countries.

If Red Imported Fire Ants arrive, they are predicted to potentially cost Tonga USD 5,594,741 per year in crop, health, and infrastructure impacts and could harm 26 already threatened species (Gruber et al. 2021).

Asian fishing vessels often carry snakes and rats, such as the Asian rat (*Rattus tanezumi*), which devastated wildlife on McKean Island in the Phoenix Group of Kiribati before it was eradicated (Pierce 2013).

Wasps (*Vespa* spp. and *Polistes* spp.) are frequent passengers on ships, already present in Kiribati and Hawai'i in the Pacific and in Australia and New Zealand. If wasps arrived in Tonga, they would harm biodiversity and people's health.

The Plague Skink (*Lampropholis delicata*) could travel to Tonga from New Zealand ports and threaten Tonga's native reptiles.

There are many more invasive species, pests, and diseases present in these countries. For example, Taro Leaf Blight (*Phytophthora colocasiae*) reduced annual export returns for this crop in Samoa from around WS\$ 10 million to around WS\$ 150,000 (USD 60,000 / NZD 84,000) over a couple of years (Hunter et al. 1998).

Even if an invasive species is already present, there are varieties and strains with different levels of impact. For example, large Black Rats that recently invaded Rennell Island in the Solomons from Southeast Asia have a devastating impact on crops, including Taro, Coconut, and Pawpaw (S Cranwell, R Pierce pers. obs.). The Coconut Rhinoceros Beetle (*Oryctes rhinoceros*) has many different strains or biotypes, and one new biotype (CRB-G) has devastated coconut crops in Guam. This new biotype is now spreading in the Pacific region, including in Hawai'i, Papua New Guinea, Solomon Islands, and other islands.

Annex 2 outlines the priority invasive species for prevention from Tonga.

## 1.2.4. Changes in impacts due to climate change

Climate change has been described as an existential problem for some Pacific Island nations (Connell 2016; Pasisi 2019). The direct environmental impacts of climate change include warmer average temperatures (including in freshwater, oceans, and lagoons), changes in weather (notable for the Pacific is an increase in frequency of high-intensity cyclones and a reduction in low-intensity cyclones), shifts in seasonal rainfall, rising sea levels, and salination. All these primary impacts have far-reaching and difficult to predict secondary consequences.

While we are still learning about the impacts of climate change, we do know some of the effects that may occur on invasive species already present.

For example, Tonga currently has several introduced species of mosquito including *Aedes aegypti* which is one of the main carriers of dengue fever. One predicted consequence of climate change could be that these and other mosquitoes and the diseases they carry may spread further south within the Pacific or introduced populations may experience faster growth. These changes may increase risks to human health.

The impacts of invasive species may become more severe if new climate conditions are more favourable for invasive species; the risks of others could lessen, but even currently harmless introduced or native species distributions and their interactions in the environment may change.

The increased intensity and frequency of extreme weather events will cause disturbance to natural and human infrastructure. Disturbed natural ecosystems are vulnerable to invasion by invasive species. Eradication and management of invasive species increases resilience in island ecosystems by allowing nature to recover from disturbance without invasion.

## 1.3. Invasive species – everyone's responsibility

The movements of people, and their goods and supplies, are the main ways that invasive species reach a country. The behaviour of all people is the key to the prevention and management of invasive species. People need to avoid bringing 'at risk' goods into the country, such as fruit, plant material including seeds, soil (even on footwear), and so on. If someone sees a plant overseas that they would like to grow in Tonga or move around the country, they must follow biosecurity requirements set by MAFF.

If people receive a container of goods or deck cargo such as a vehicle or timber, they should check it very carefully when they get it home and alert MAFF if any live animals/insects, or their eggs, are found. Ideally, people will be watchful in villages, plantations, and forests for any unusual animals or plants or for trees with leaves being eaten or dying over large areas. Villagers may be the first to spot the arrival of a new plant disease or insect pest. Detecting such arrivals early is the key to eradicating a new invasive species and potentially saving Tonga millions of dollars or, worse, the loss of biodiversity.

iNaturalist is a social network of naturalists, citizen scientists, and biologists built on the concept of mapping and sharing observations of biodiversity across the globe. It enables residents and visitors to actively take part in biodiversity monitoring.

The iNaturalist project created as part of the GEF 6 RIP will contribute to protecting Tonga's biodiversity by acting as an 'early warning system' for new invasive species observed

within Tonga.

Invasive species are an international issue with an emphasis on preventing them moving from one country to another. Several international and regional organisations undertake coordinating roles, there are international regulations, and countries that trade with each other work in close cooperation.

## 1.4. Biodiversity at risk in Tonga

All native species are at risk from the impacts of invasive species. Those most at risk are those that are already rare due to other impacts, such as overharvesting, pollution, and habitat loss. These rare species are priorities for conservation.

The NBSAP (2006) outlines activities to ensure Tonga's priority threatened and endemic species are protected and thriving in their natural habitats (refer Section 1.4). The NBSAP (2006) identified many terrestrial and marine species that are at risk in Tonga. Key forest species at risk at the time were as follows:

- Critically endangered forest tree Langakalivao (an endemic mahogany, *Aglaia heterotricha*) and Iguana (*Brachylophus fasciatus*);
- Endangered Pekepeka (a native microbat, *Emballonura semicaudata*);
- Vulnerable Langakali (also a native mahogany, *Aglaia saltatorum*), Uhiuhi (an endemic podocarp, *Podocarpus pallidus*), Longolongo (a native cycad, *Cycas seemannii*), Malau (the endemic Tongan Megapode (*Megapodius pritchardii*) and Alopecoenas stairi (the native Shy Ground-dove);
- Near-threatened Hengehenga (the endemic Tongan Whistler, *Pachycephala jacquinoti*);
- 'U'u (Coconut Crab, *Birgus latro*) important as food along with peka and others;
- Olive Small-scaled Skink (*Emoia lawesi*), which may already be extinct;
- More than 11 flowering plant species that are endemic to Tonga (Park and Whistler 1998).

Multiple marine and coastal species were also at risk:

- Critically endangered Hawksbill Turtle (*Eretmochelys imbricata*);
- Vulnerable Fonutu'akula (native Green Turtle, *Chelonia mydas*) and Tongolei (a native mangrove, *Rhizophora samoensis*);
- Giant Clams (*Tridacna* spp.), many coral species, fin-fish, whales, and tuna that were identified by stakeholders in 2006 as important native marine species for ecosystem functioning and providing food.

The local conservation status of the endangered Phoenix Petrel (*Pterodroma alba*) and other seabirds as well as Humphead Wrasse (*Cheilinus undulatus*) also need to be clarified.

Birdlife International (2021b) records 11 Important Bird Areas for Tonga (see Annex 3). In 2007, issues and likely threats to these IBAs were provisionally identified as natural and artificial habitat destruction including deforestation and fires, predators (particularly humans, cats, and rats), and poor community awareness (Environmental Consultants Fiji 2007). Some of these areas have since been the focus of ongoing management including habitat protection, invasive

species management, and awareness raising.

## 1.5. Why is a NISSAP needed?

There are many reasons to develop a NISSAP, but the key five reasons are outlined below.

### **INVASIVE SPECIES ARE A CONSISTENT THREAT TO RESOURCES**

Invasive species continue to be a costly issue for all countries and particularly for island nations, and the threat of new species arriving is increasing with increasing trade and movement of people between countries. A NISSAP can highlight the issue and bring it to the attention of national and international decision makers.

### **A NISSAP PRIORITISES INVASIVE SPECIES ISSUES**

Every country is faced by a wide range of invasive species causing various degrees of damage, many more than the country has the capacity to address. Management has focused on plant and animal pests of the productive sector in the past and on direct threats to human health, but there has been growing recognition of the impacts of invasive species on native biodiversity and the whole environment.

A NISSAP can bring people in the different sectors and the wider community together to agree on the priorities.

### **CREATING A NISSAP IS A CROSS-SECTORAL AND INCLUSIVE EXERCISE**

The management of invasive species involves many different organisations from government departments to non-governmental organisations (NGOs), farmers, fishermen and women, and island communities. This management effort has in the past been fragmented and uncoordinated.

The NISSAP seeks to address this problem by bringing all stakeholders together around an agreed plan of priority actions, with clearly identified responsibilities and timeframes.

### **A NISSAP SUPPORTS A COORDINATED APPROACH**

Managing invasive species involves many activities, including border control, awareness raising, research, monitoring, eradication, control, and risk assessment. A NISSAP allows appropriate prioritisation of the different elements and spread of resources across them.

### **A NISSAP IDENTIFIES RESOURCES**

There is always more work to be done than a Pacific island country can afford with its own resources. An approved NISSAP identifies that a country has been through a prioritisation process involving a full range of stakeholders and that the government has endorsed its findings.

A NISSAP thus gives a funder a priority list of tasks that require money and assurance that the country will commit the 'in-kind' support required to achieve successful outcomes.

## 1.5.1. PRISMSS supports the NISSAP implementation

The Pacific Regional Invasive Species Management Support Service (PRISMSS) is a coordinating mechanism to facilitate the scaling up of operational management of invasive species in the Pacific. PRISMSS brings together experts to provide support within the Pacific region with a focus on protection of indigenous biodiversity and ecosystem function. The goal is to reduce the ecological and socio-economic impact of invasive species on ecosystems through the management or eradication of prioritised species and the protection of valued sites.

PRISMSS supports the implementation of NISSAPs by:

- providing advice to foster on-the-ground-management actions including the development of new projects;
- helping lead the adoption and the development of best practice and innovation in the region;
- sharing technical information as far as practical for publication or training materials;
- providing training, coaching, and project planning support for project execution; and
- providing donors with customised and successful options.

PRISMSS currently provides technical support across five regional programmes for the Pacific region:

### 1. Protect our islands – “Prevent the Arrival, Establishment and Spread of Invasive Species”

After an invasive species arrives in a new place, it needs to survive and reproduce, establish a population, and spread, before impacts are noticed. By the time impacts are obvious, the control or eradication of invasive species can be difficult and expensive or sometimes impossible. The purpose of this programme is to prevent or detect the arrival of invasive species and stop their establishment, spread and impacts.

The clean boats, clean ports framework guides the programme. The framework defines actions needed to detect the arrival and prevent the establishment and spread of invasive species within Pacific island countries and territories.

### 2. Predator-free Pacific – “Removing Introduced Mammalian Predators from Islands”

Pacific islands connect land and sea. Invasive species such as rats alter ecosystems as they consume the seeds, plants, invertebrates, and seabirds that provide nutrients to forest systems and coastal waters. The prevention, control, and eradication of invasive predators are important strategies for supporting ecosystem-based adaptation to the effects of climate change. Sixty (60) Pacific islands have had predators removed, as of the time of writing (2021).



### 3. War on weeds – “Management of High Priority Weeds”

Some invasive plants can transform (damage or destroy) ecosystem function. Weeds outcompete more desirable plant species and disrupt processes such as water flow, fire regimes, soil quality, nutrient cycling, and regeneration. Weeds can also be harmful to human and animal health. Weeds thrive on disturbance and so their harmful impacts are exacerbated by tropical cyclones, strong winds, drought, and fires, all of which are increasing in severity due to the changing climate. Although there are several existing weed management programmes across the Pacific, capacity overall is very limited. This programme is focused on the management of high-risk, low-distribution weed species, where the objective is eradication or containment.

### 4. Natural enemies – natural solutions – “Biological Control of Widespread Weeds”

Conventional control techniques can be useful when weeds are not yet common and to protect high-value sites. However, once weeds become widespread, the only safe, cost-effective, and sustainable way of tackling them is using natural enemies, which is known as biological control. This regional programme aims to lower the impact of widespread invasive plants by reducing their vigour by introducing safe natural enemies from the area where they, and their host plant, originate. This technique has been used safely and successfully worldwide, including the Pacific, to manage weeds for more than 100 years. Natural enemies have been established on more than 25 weed species in 17 countries in the Pacific, and there are many opportunities both for spreading existing agents available in the Pacific to new countries, from introducing agents available outside the Pacific and through developing new options for the Pacific.

### 5. Resilient ecosystems – resilient communities – “Priority Area Ecological Restoration”

Pacific threatened species and ecosystems often exist within high-value areas on larger islands where invasive animals and invasive plants will continue to be a threat. A site-led approach to manage multiple invasive species and re-introduce lost native species and ecosystem structure over a longer period is the last remaining option to restore and maintain these ecosystems. Communities directly benefit from resilient ecosystems and are an essential part of ecological restoration. Many priority area ecosystems have been restored over the past three decades, mostly in New Zealand. The Pacific has had several pilot sites which have had very successful outcomes with increases in threatened endemic birds.



## 1.6. Process of NISSAP development

A NISSAP takes account of the regional guidelines<sup>2</sup> produced by SPREP and SPC, whose goal is “to assist Pacific island countries and territories in planning the effective management of invasive species, thereby reducing the negative impacts of invasives on their rich and fragile native heritage, communities and livelihoods” (SPREP 2009). The Action Plan is organised according to the three thematic areas of the Guidelines: Foundations, Problem Definition/Prioritisation, and Management Action.

### 1.6.1. History of NISSAP development in Tonga

A National Strategy and Action Plan for Invasive Species for Tonga was first adopted in 2013. It aligns with the NBSAP (2006) which had also identified some invasive species issues that needed to be addressed to protect Tonga’s biodiversity values. The first NISSAP (2013–2020) was developed with the Ministry of Lands, Environment, Climate Change and Natural Resources, funded within the GEF-PAS regional invasive species project ‘Prevention, control, and management of invasive alien species in the Pacific Islands’ implemented by UNEP with SPREP as the executing agency. That document prioritised the invasive species component in the Tonga’s NBSAP (2006) and addressed the Aichi Biodiversity Targets, the targets of the Convention on Biodiversity Strategic Plan for Biodiversity 2011–2020.

This document is Tonga’s second NISSAP and is supported within the GEF 6 Regional Invasive Species project ‘Strengthening national and regional capacities to reduce the impact of Invasive Alien Species on globally significant biodiversity in the Pacific’ implemented by UNEP with SPREP as the executing agency.

The revised NISSAP incorporates information from Tonga’s first NISSAP, current information on national strategies and management programmes provided by the National Invasive Species Co-ordinator, and the outcomes of stakeholder consultations. Consultations were held in August 2021 during which previous NISSAP actions were reviewed and invasive species priorities going forward were discussed. PRISMSS partners also reviewed the Action Tables. The Tonga National Technical Advisory Group reviewed drafts before these were *finalised*.



<sup>2</sup> Guidelines for Invasive Species Management in the Pacific; see <https://brb.sprep.org/>

## 2. LINKAGES OF THE NISSAP TO OTHER STRATEGIES

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This section reviews other Government strategies and policies that address invasive species and the sectoral plans of the key agencies involved. The actions identified in this NISSAP should be considered when strategies and plans next revised.

### 2.1. National strategies

Invasive species can have impacts on agricultural, forestry, and fisheries sectors, may spread or have increased impacts because of climate change, and are at higher risk of entering the country during the response to a natural disaster such as a cyclone. It is hoped that the NISSAP will be referred to during the development of strategies and plans within these sectors.

#### JOINT NATIONAL ACTION PLAN 2 ON CLIMATE CHANGE AND DISASTER RISK MANAGEMENT (JNAP 2) 2018–2028

The JNAP2 aims to achieve its vision of a Resilient Tonga by 2035. JNAP2 is aligned with the Tonga Climate Change Policy and covers both climate change adaptation and disaster risk management. Taking a 'whole of Tonga' approach, JNAP2 is consistent with the Framework for Resilient Development in the Pacific (FRDP) and international agreements.

#### THE TONGA STRATEGIC DEVELOPMENT FRAMEWORK (TSDF) 2015–2025

The TSDF outlines strategic national outcomes across seven themes:

**NATIONAL OUTCOME A:** dynamic knowledge-based economy

**NATIONAL OUTCOME B:** urban and rural development

**NATIONAL OUTCOME C:** human development with gender equality

**NATIONAL OUTCOME D:** good-governance strengthening rule of law

**NATIONAL OUTCOME E:** infrastructure and technology

**NATIONAL OUTCOME F:** land, environment, and climate

**NATIONAL OUTCOME G:** external interests and sovereignty

National Outcome F focuses on sustainable environmental management, increased resilience to the risks posed by climate change, and notes the vulnerability of Tonga to adverse natural events.

The outcomes are also grouped into five pillars, which have linkages among them:

**PILLAR 1:** Economic Institutions

**PILLAR 2:** Social Institutions

**PILLAR 3:** Political Institutions

**PILLAR 4:** Infrastructure and Technology Inputs

**PILLAR 5:** Natural Resources and Environment Inputs

The Natural Resources and Environment Input pillar focuses on:

- improved land use planning, management, and administration for private and public spaces;
- improved use of natural resources for long term flow of benefits – including a target KPI of “100% Invasive Alien Species (IAS) project implemented”, as part of the MEIDECC Corporate Plan 2015/16 to 2017/18;
- cleaner environment with improved waste recycling; and
- improved resilience to extreme natural events and impact of climate change.

## NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN 2006

The 2006 NBSAP identified the indiscriminate spread of agriculture as the primary threat to Tongan biodiversity. It also noted the role of invasive species in that “Degraded and disturbed ecosystems provide conditions conducive to the spread of invasive weed and fauna (animal) species”. The Plan noted the importance of preventing new invasive species and of controlling or eradicating existing invasive species, as well as the importance of awareness and protecting priority sites.

## 2.2. Corporate plans

Tonga’s Ministries have corporate plans that support the TSDF and outline current and planned short-term activities. Invasive species fall under the MAFF corporate plan (2020/21–2022/23) within the border control and quarantine requirements for imports, and management of existing crop pests, which also apply to invasive species. The MEIDECC corporate plan (2019/20–2021/22) includes provision for a revised national biodiversity strategy and development and implementation of invasive species activities, as well as landscaping and beautification of reserve parks and protected area management (under Program 6: Environment). The Ministry of Fisheries corporate plan (2020/21–2022/23) refers to aquatic biosecurity to protect marine and aquaculture resources.

## 2.3. Regional strategies

### FRAMEWORK FOR NATURE CONSERVATION AND PROTECTED AREAS IN THE PACIFIC ISLANDS REGION 2021–2025

The *Framework* provides guidance for the region on key priorities for biodiversity conservation and ecosystem management with linkages to the global Aichi Biodiversity Targets and National Biodiversity Strategies and Action Plans (NBSAPs).

### GUIDELINES FOR INVASIVE SPECIES MANAGEMENT IN THE PACIFIC (ENDORSED 2009)

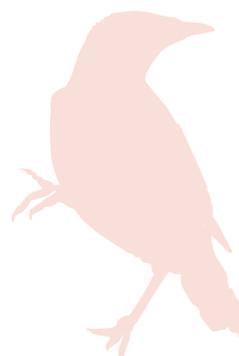
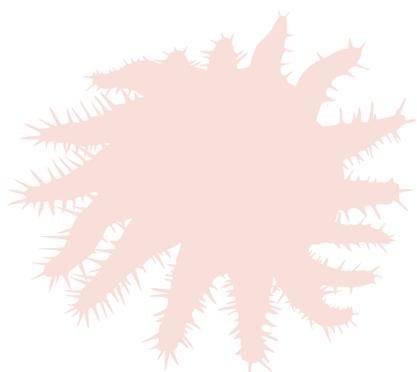
The goal of the *Guidelines* is to assist Pacific island countries and territories in planning the effective management of invasive species, thereby reducing the negative impacts of invasives on their rich and fragile natural heritage, communities, and livelihoods. The guidelines are currently (2021) being revised.

### 3. GUIDING PRINCIPLES

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The CBD identified a full list of 15 principles as an Annex to the report of the Conference of the Parties 6 (COP 6 2002a). Some key practical principles apply to the NISSAP:

- The ‘precautionary principle’ should be applied: where there is not enough information to predict whether a species will become invasive or not, it should be assumed that it will have a damaging impact and action should be taken to stop it establishing or spreading.
- Preventing the arrival of introduced species is more effective and cheaper than trying to manage them after they arrive. Emphasis should be placed on effective border control.
- Eradication is more effective and cheaper in the long term than ongoing control, so eradication should be attempted in situations in which it is likely to succeed.
- Eradication is most effective if a new arrival is detected early while in small numbers, so surveillance and early warning systems are important, as is rapid response. Emergency Response Plans, such as those in place for the possible arrival of major livestock diseases, and Emergency Response Exercises are key elements of such systems.
- Invasive species that cannot be eradicated should be considered for ongoing control, particularly biological control. This control may be aimed at reducing their impact everywhere to acceptable levels or only in important sites for native species (such as protected areas) or for agriculture.
- Invasive species must be addressed in order of priority. A rigorous system is needed to decide on priorities and stick to them.
- Any species imported into a country to only be kept in ponds, pens, or cages will eventually escape into the wild, and plans should be made accordingly.





## 4. GOAL, THEMES, AND OUTCOMES

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### 4.1. Goal

To facilitate and guide the protection of the biodiversity and livelihoods of Tonga from the impacts of invasive species through strong collaboration.

Within the goal, emphasis is to be placed on:

- maintaining and enhancing the status of native biodiversity;
- maintaining strong border control;
- developing an inter-island biosecurity programme;
- eradicating invasive species where this is feasible; and
- controlling those species that cannot be eradicated.

### 4.2. Themes

The strategy follows the Regional Guidelines (SPREP 2009) with three themes as follows:

#### THEME A: FOUNDATIONS

Managing invasive species is a huge task that will only be effective if based on strong foundations. It requires:

- **support** – from Government, village communities, and funders;
- **capacity** – including strong institutions, individuals with sound management and technical skills, and regional networks; and
- **legislative framework** – appropriate laws, regulations, policies, protocols, and procedures.

#### THEME B: PROBLEM DEFINITION, PRIORITISATION, AND DECISION-MAKING

There are many invasive species present in Tonga and many more outside its borders, and resources to tackle them are always limited. There need to be systems in place to make decisions about how to allocate resources based on the best possible information on the distribution, numbers, and likely impacts of these species.

#### THEME C: MANAGEMENT ACTION

Management begins with preventing the arrival of new invasive species, then tackles the eradication or control of those already present. Finally, any restoration work needed is conducted on sites where invasive species have been removed.

## 4.3. Outcomes

Outcomes are derived from the SPREP Guidelines.

**Theme A:** Three outcomes are identified to ensure that the impacts of invasive species are understood and actions to manage them supported, to develop the necessary capacity, and to establish the appropriate legislative and operational framework.

**Theme B:** Three outcomes are identified to establish baseline information and monitor change, establish systems for risk management and prioritisation, and update knowledge and develop new techniques.

**Theme C:** Three outcomes are identified to prevent the arrival of new invasive species and quickly detect and respond to those that arrive, to eradicate or control existing invasive species, and to carry out restoration following invasive species removal.



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## 5. PATHWAY IDENTIFICATION

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ISSG has compiled a review (ISSG 2013) that identifies the ways that the different invasive species present in Tonga can move around. As an example of a pathway, soil is a medium that can transport weed seeds, the nests of ants, the eggs of Giant African Snail (*Achatina fulica*), and larvae of pest insects. This section reviews the major pathways through which invasive species can enter the country or move between islands within it.

### 5.1. International pathways

#### 5.1.1. By air

Outside the current COVID-19 pandemic period, direct flights to Tonga include flights from three countries:

- New Zealand (Air New Zealand and Virgin Australia operate regular flights from Auckland);
- Australia (Qantas, Fiji Airways, and Virgin Australia offer regular flights from Sydney); and
- Fiji (Fiji Airlines operate regular flights from Nadi).

There are two international airports in Tonga: at Nuku'alofa and Vava'u. More than 53,800 visitors were recorded as having arrived by air to Tonga in 2015 (CIA 2021). Although biosecurity is in place at all sources and in Tonga, there are on-going significant risks of concealed introductions of plant material, micro-organisms, seeds, and invertebrate eggs that may be introduced through undeclared food and other items.

During the COVID-19 pandemic, Fua'amotu International Airport is the only entry point. Flights are limited to an Air New Zealand cargo flight once a week and repatriation flights from New Zealand, Fiji, Australia, and Samoa. Passenger's accompanied luggage is a major biosecurity risk during the pandemic due to the requirement for no-contact protocols and the lack of an X-ray machine at the airport.

#### 5.1.2. By sea

##### COMMERCIAL SHIPPING

Outside of the current COVID-19 pandemic, freight ships, including container ships, come to Tonga from multiple countries:

- Australia — regular container ships from Melbourne, Sydney, and Brisbane (all transit in Fiji),
- New Zealand — Pacific Forum Line from Auckland that transits in Rarotonga and Aitutaki in the Cook Islands on the way to Vava'u (suspended during the pandemic because Tongatapu is the only active entry port),
- New Zealand and the USA — Pacific Forum Line from Auckland that transits in Samoa and Pagopago in American Samoa before arriving in Nuku'alofa,
- Fiji — Pacific Forum Line freight and containers to Nuku'alofa, and
- Hawai'i (not direct) and Japan (mostly vehicles) — regular container ships to Nuku'alofa.

## FISHING VESSELS

Tongan waters host international fishing. Reopening of Tongan waters to licensed foreign fishing vessels along with the development of aquaculture were areas that the previous NISSAP identified as targets for biosecurity improvement. These actions are under the mandate of the Ministry of Fisheries and Marine Department regulations.

Asian fishing vessels (which all transit in Fiji) are known to carry snakes and rats, and biosecurity at the home ports is often inadequate.

## YACHTS

More than 2,000 yachts visited Tonga annually pre-pandemic (NISSAP 2013), and this high level of visitation is likely to return post-pandemic. During the COVID-19 pandemic, yacht entry is prohibited. No data are available on sources, but they will likely include many 'puddle jumpers', that is, vessels sailing between many Pacific island countries. This will include many yachts from the USA and the Caribbean sailing through the Panama Canal, French Polynesia, and radiating throughout other Pacific Island countries, including Tonga.

The greatest invasive species risks from yachts are escapes at marinas. Most destinations mandate minimal contact between yachts and the shore to limit the transfer of terrestrial invasive species. The risk is largely from mobile species, birds, flying insects, bird diseases (such as from pet parrots), rats (by swimming), and marine invasives from hull infestations. Masters of yachts are obliged to follow [biosecurity requirements](#).

### 5.1.3. Other external pathways

#### DISASTER RELIEF

Humanitarian emergencies in general and damage caused by extreme events such as cyclones may directly carry new invasive species to Tonga, but their major threat is an indirect one through consequent relief operations. The tension between the needs of maintaining biosecurity and that of relief is not limited to Tonga.

Tonga experiences frequent cyclones which are projected to increase in intensity with climate change. As a result, large quantities of humanitarian aid can be rushed in to deal with the country's urgent needs in their aftermaths. Large shipments of supplies and relief materials may enter the country over a short period from a variety of different countries, at a time when border control may be limited or of lower priority. While humanitarian needs are the priority, disaster management planning needs to incorporate biosecurity to avoid the potential longer-term impacts of new invasive species on the economy and environment.

#### 'NATURAL' PATHWAYS

New species can also reach Tonga without the aid of human transportation. Although natural flight, being carried by the wind, swimming, or rafting on floating objects/vegetation can move species to any new place, there are no records of unassisted arrivals in Tonga. Despite a lack of records, there is a need for people to keep watch for any unusual species or any new signs of damage to plants or harm to animals.

## 5.2. Internal pathways

Domestic transport routes are potential pathways for many invasive species already present in Tongatapu (for example) to reach and establish at the other island groups. Risks include Banana Bunchy Top Virus (present in Tongatapu) with banana plants, invasive plants (such as Lantana) being transported as nursery ornamentals or accidentally as seed to outer islands, and Yellow Crazy Ant nests in nursery plants, machinery, timber, encrusted soil, and other goods. These and other general pathways for introducing invasive species are identified in the Tonga desktop review (ISSG 2013). Community consultation also noted Domestic Pigeons (*Columba livia*) as an undesirable species now established on Tongatapu and which could be introduced to outer islands.

Other inhabited islands (and some uninhabited) receive visits from tourism operators, domestic fishers, and other vessels.

**TABLE 1: Domestic inhabited island group transport linkages**

ISLAND	DOMESTIC AIRPORT	DOMESTIC SEA FREIGHT	OTHER SEA LINKS: PASSENGERS, LOCAL FISHING, TOURISM, ETC.
Lifuka	Y		Y
Pangai		Y	Y
Neiafu	Y		Y
ʻEua	Y		Y
Niuatoputapu	Y		Y
Vavaʻu	Y	Y	Y
Tongatapu	Y	Y	Y

### 5.2.2. By air

There are two international airports in Tonga (Fuaʻamotu on Tongatapu, and Vavaʻu). Four additional airports are for domestic travel—ʻEua, Lifuka (Haʻapai), Niufoʻou and Niuatoputapu—and the two international airports also provide a domestic service.

### 5.2.3. By sea

Internal sea traffic includes three major categories:

- **Domestic freight** – the main ports for domestic freight are Tongatapu, ʻEua, Neiafu (Vavaʻu) and Pangai (Haʻapai). The northernmost islands of Niufoʻou, Niuatoputapu, and Tafahi are also serviced.
- **Tourism** – the ports of entry are at Tongatapu and Neiafu (Vavaʻu), but tourist operators visit other inhabited and uninhabited islands of Tonga.
- **Domestic fishing** – domestic fishing and recreation occurs around all the inhabited islands.



Uonukuhififo (top),  
Uonukuhahake (bottom),  
Ha'apai group, Tonga.  
Source: Wikipedia

## 6. ROLES AND RESPONSIBILITIES OF STAKEHOLDERS IN INVASIVE SPECIES MANAGEMENT

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This section identifies the different government agencies and NGOs that have roles in invasive species management.

### 6.1. Local community

#### TONGA COMMUNITY DEVELOPMENT TRUST

The Trust has a major programme in the sector of environment and natural resources with strong involvement in community forestry. It runs multipurpose nurseries in Vava'ú, Ha'apai, and 'Eua.

#### CIVIL SOCIETY FORUM OF TONGA

The Forum is an umbrella organisation which aims to support all NGOs by providing opportunity for capacity building and leadership development.

#### OTHER GROUPS

The Vava'ú Environmental Protection Association (VEPA) works on community-led environmental restoration programmes in Vava'ú.

Hango Tertiary College includes environmental education in its courses.

MORDI Tonga Trust empowers isolated rural communities to fight against poverty, through providing skill development training and implementation of community development projects.

Tupou College Toloa work on community led environmental restoration programmes in Toloa Rainforest.

### 6.2. National

Many government ministries contribute to invasive species prevention and management in Tonga. The key ministries are MEIDECC, MAFF, MOF, and MOI.

#### MINISTRY OF METEOROLOGY, ENERGY, INFORMATION, DISASTER MANAGEMENT, ENVIRONMENT, CLIMATE CHANGE AND COMMUNICATIONS (MEIDECC)

The MEIDECC is the ministry responsible for biodiversity protection, including invasive species initiatives. The MEIDECC grew out of the Ministry of Lands, Environment, Climate Change and Natural Resources (MLECCNR), which was established in 2009 in recognition of the importance of the environment and sustainable management of natural resources as the basis for the economic, social, and cultural development.

## MINISTRY OF AGRICULTURE, FOOD AND FORESTS (MAFF)

The MAFF has several key responsibilities for environmental management and protection from invasive species. Biosecurity is undertaken by the Quarantine and Quality Management Division (QQMD). The Department of Forestry of MAFF plays an important role in managing forest resources in a sustainable manner.

## MINISTRY OF FISHERIES (MOF)

The Ministry of Fisheries has responsibility for the conservation, management, and development of fisheries and the authority to conserve endangered inshore marine resources.

## MINISTRY OF INFRASTRUCTURE (MOI)

The Ministry of Infrastructure is responsible for the rules, regulations, and enforcement, consistent with Tongan law and international standards, to guide the safe and secure operations of maritime services and ports. Of particular concern are ballast water and hull pathways of invasion.

## 6.3. Regional

SPREP and SPC are the two key agencies providing regional coordination and support for the management of invasive species with impacts on native biodiversity and on the agricultural and fisheries sectors, respectively. SPC also supports border control programmes. Annex 4 provides further details of their roles and identifies other agencies and initiatives that support invasive species work in the region.

The PRISMSS partners represent the regional support mechanisms for invasive species management support:

PRISMSS PROGRAMME	SCOPE	LEADING TECHNICAL PARTNER(S)
<b>Protect our islands</b>	Prevent the Arrival, Establishment and Spread of Invasive Species	Pacific Biosecurity (Wellington UniVentures) and SPC
<b>Predator free Pacific</b>	Removing Introduced Mammalian Predators from Islands	Island Conservation and Birdlife International
<b>War on weeds</b>	Management of High Priority Weeds	SPREP
<b>Natural enemies – natural solutions</b>	Biological Control of Widespread Weeds	Manaaki Whenua – Landcare Research
<b>Resilient ecosystems – resilient communities</b>	Priority Area Ecological Restoration	SPREP

## 7. PAST AND CURRENT PROGRAMMES

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Invasive species work undertaken since 2013 includes a wide range of prevention, planning, and management programmes. Many of these are collaborative programmes among MEIDECC, MAFF and communities, spanning management, and/or eradication of key invasive plants and mammals.

### GEF 6 REGIONAL INVASIVE SPECIES PROJECT (GEF 6 RIP)

As part of the GEF 6 Regional Invasive Species Project ‘Strengthening national and regional capacities to reduce the impact of Invasive Alien Species on globally significant biodiversity in the Pacific’ (GEF 6 RIP), several activities are being undertaken and planned through the PRISSMS, including:

- NISSAP development,
- reviews of legislation, policy, and regulations,
- Early Detection and Rapid Response Planning,
- interisland biosecurity protocols,
- Ballast Water Convention compliance,
- weed and other high-risk species surveillance programmes,
- biodiversity baseline surveys, include pest distributions,
- risk assessment protocols,
- economic assessments,
- eradication projects,
- extension officer capacity-building,
- assessments of the economic impacts of invasive species,
- awareness and outreach programmes, and
- building capacity to undertake biocontrol for invasive weeds.

### EDUCATION AND AWARENESS

MAFF provides ongoing education material to communities and stakeholders for:

- quarantine export/import procedures in relation to invasive species;
- plant protection issues in relation to invasive species, such as Banana Bunchy Top Virus and Coconut Rhinoceros Beetle;
- livestock production guidelines; and
- targeted material for tertiary education at Hango College.

## WEED BIOCONTROL PROGRAMMES

In the past, several insects have been introduced into Tonga for the biological control of weeds, which have often proven to be successful (Manaaki Whenua Landcare Research 2020, 2021). Introductions (deliberately with the assistance of SPC, some natural, and some through unknown means) have targeted:

- *Lantana camara*. A leaf-mining beetle (*Uroplata girardi*) and lacebug (*Teleonemia scrupulosa*) are effective. A third insect (*Leptobyrsa decora*) did not establish. Five other natural enemies that have not been deliberately released are having slight impacts (*Calycomyza lantanae*, *Crocidosema lantana*, *Lantanophaga pusillidactyla*, *Ophiomyia lantanae*, and *Salbia haemorrhoidalis*).
- *Mimosa diplotricha*. A psyllid (*Heteropsylla spinulosa*) found only in Vava'u targets this invasive plant.
- *Cyperus rotundus*. May have been functionally eradicated by two natural enemies.
- *Elephantopus mollis*. May have been functionally eradicated by a self-introduced natural enemy.
- *Leucaena leucocephala*. A seed-feeding beetle (*Acanthoscelides macrophthalmus*) is present, although not deliberately released. The beetle damages a small proportion of seeds.

## ENHANCED PACIFIC BIOSECURITY PARTNERSHIP

The Enhanced Pacific Biosecurity Partnership programme is a New Zealand MFAT sponsored collaboration with New Zealand Ministry of Primary Industries to enhance import and export procedures for biosecurity, including training in surveillance for invasive ants. The programme runs for five years from 2022.

## SAFE AGRICULTURE TRADE FACILITATION THROUGH ECONOMIC INTEGRATION IN THE PACIFIC (SAFE PACIFIC)

Led by SPC and financed by the European Union, the SAFE Pacific project (2021–2025) provides targeted assistance in the areas of sanitary and phytosanitary improvement and value chain strengthening to increase export capacity and improve economic growth in 15 Pacific island countries. Tonga will receive X-ray facilities as part of this project, among other initiatives.

## PACIFIC AGREEMENT ON CLOSER ECONOMIC RELATIONS (PACER) PLUS

PACER Plus is a landmark trade and development agreement that will raise living standards, create jobs and increase exports in Pacific island countries, while also lowering barriers and providing greater certainty for New Zealand businesses. Among other activities, a project under the PACER Plus development cooperation assistance will assist Tonga with biosecurity enhancements, such as incineration facilities for banned imports.

## 8. LEGISLATION AND INTERNATIONAL CONVENTIONS

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The following Acts, Regulations and Conventions and Protocols include provisions relating to invasive species prevention and management.

### 8.1. National legislation

National legislation that is relevant to environmental protection and invasive species management in Tonga includes:

#### **BIRDS AND FISH PRESERVATION ACT 1974 (AMENDED)**

The Birds and Fish Preservation Act describes the regulations for protecting of bird and fish species, including harvesting and any other impacts.

#### **PARKS & RESERVE ACT 1976**

The Parks and Reserves Act describes existing parks and reserves and regulations for their protection and management.

#### **ANIMAL DISEASES ACT 1988 (AMENDED 2002)**

The Animal Diseases Act describes regulations for imported and resident animals and disease-screening requirements.

#### **THE PLANT QUARANTINE ACT, VOL. 4. 1988 AND PLANT QUARANTINE REGULATION 1995**

The Plant Quarantine Act and Regulation describe the regulations and procedures associated with importation of plants and their products.

#### **NOXIOUS WEEDS ACT 1988**

The Noxious Weeds Act describes exclusion and management regulations for imported and noxious plants.

#### **TERRESTRIAL AND FISHERIES (CONSERVATION AND MANAGEMENT) REGULATION 1994**

The Terrestrial and Fisheries Regulation describes conservation and management regulations for a broad range of terrestrial and marine species.

#### **PESTICIDES ACT 2002**

The Pesticides Act regulates the importation and sale of pesticides in Tonga and is relevant when developing EDRR plans.

#### **ENVIRONMENT MANAGEMENT ACT 2010**

The Environment Management Act describes regulations and procedures associated with environmental management and developments.

## 8.1.1. Under development

### BIOSECURITY BILL

A Biosecurity Bill to harmonise Tonga's legislation with that in the rest of the region has been in draft form for several years. The draft Bill requires further community consultation before it can be presented to Parliament.

## 8.2. International conventions and agreements

Tonga is party to the following Multilateral Environmental Agreements (in order of relevance):

### CONVENTION ON BIOLOGICAL DIVERSITY (CBD)

The CBD, ratified in 1993, is the key convention relating to the conservation of plants, animals, and ecosystems. It requires countries to develop a NBSAP and specifically to “prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.”

The Convention's Aichi Target 9 states: ‘By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled, and measures are in place to manage pathways to prevent their introduction and establishment.’ The post-2020 Global Biodiversity Framework establishing new targets is under preparation (2022).

### CARTAGENA PROTOCOL ON BIOSAFETY

The Cartagena Protocol to the Convention on Biological Diversity aims to ensure the safe handling, transport, and use of living modified organisms (LMOs) resulting from modern biotechnology. The Parties undertake to ensure that the development, handling, transport, use, transfer, and release of any LMOs are undertaken in a manner that prevents or reduces the risks to biological diversity, also considering risks to human health. While LMOs are different from invasive species, similar processes of risk management, border control, and quarantine apply.

### UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION (UNCCD)

Established in 1994, the UNCCD is the sole legally binding international agreement linking environment and development to sustainable land management. The Convention addresses specifically the arid, semi-arid, and dry sub-humid areas, known as the drylands, where some of the most vulnerable ecosystems and peoples can be found.

### CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES (CITES)

CITES controls the trade in specimens of endangered species by requiring import and export permits for those on an international list. In carrying out the inspections and permitting requirements under CITES to prevent trade in endangered species, countries may also detect the movement of invasive species and be able to prevent their entry.

## UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)

The ultimate objective of the UNFCCC is to stabilise greenhouse gas concentrations “at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system.” It states that “such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner.” The UNFCCC entered into force on 21 March 1994. Today, it has near-universal membership.

## THE KYOTO PROTOCOL

Adopted on in 1997 and ratified in 2005, the Kyoto Protocol operationalises the UNFCCC by committing developed countries and economies in transition to limit and reduce greenhouse gases emissions in accordance with agreed individual targets. The Convention itself requires those countries to adopt policies and measures on mitigation and to report periodically.

## THE PARIS AGREEMENT

The Paris Agreement is a landmark in the multilateral climate change process because, for the first time, a binding agreement brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects. Adopted by 196 Parties at the UNFCCC Conference of Parties (COP) 21 in Paris in 2015, it entered into force on 4 November 2016. Its goal is to limit global warming to well below 2 degrees Celsius, and preferably to 1.5 degrees Celsius compared to pre-industrial levels, to achieve a climate neutral world by mid-century.

## SUSTAINABLE DEVELOPMENT GOALS (SDGS)

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are a call for action by all countries—developed and developing—in a global partnership. They recognise that ending poverty and other deprivations must go together with strategies that improve health and education, reduce inequality, and spur economic growth, all while tackling climate change and working to protect the environment.

## FRAMEWORK FOR RESILIENT DEVELOPMENT IN THE PACIFIC (FRDP)

The FRDP (2016) is the current regional policy that guides action to ensure that future development is more resilient to the adverse effects of climate change and disasters. The Pacific Resilience Partnership (PRP) is the umbrella implementation mechanism for the FRDP.

## INTERNATIONAL PLANT PROTECTION CONVENTION (IPPC)

The IPPC is an international agreement on plant health developed in 1951 and overseen by the United Nations Food and Agriculture Organisation (FAO). Its objectives include:

- protecting sustainable agriculture and enhancing global food security through the prevention of pest spread;
- protecting the environment, forests, and biodiversity from plant pests;

- facilitating economic and trade development through the promotion of harmonised scientifically based phytosanitary measures; and
- developing phytosanitary capacity for members to accomplish the preceding three objectives.

## **AGREEMENT ON THE APPLICATION OF SANITARY AND PHYTOSANITARY MEASURES (SPS AGREEMENT)**

The SPS Agreement was adopted in 1994 and entered into force in 1995. The agreement applies to the importation of pests, diseases, disease-carrying organisms, or disease-causing organisms.

- Provides a uniform interpretation of the measures governing safety and plant and animal health regulations.
- Applicable to all sanitary and phytosanitary measures, directly or indirectly affecting international trade.
- Sanitary and phytosanitary measures are defined as any measure applied to protect animal or plant life or health within a Members' Territory from entry, establishment or spread of pests, diseases, and disease-carrying organisms and to prevent or limit other damage within the Members Territory from the entry, establishment, or spread of pests.

## **UNITED NATIONS CONVENTION ON THE LAW OF THE SEA (UNCLOS)**

UNCLOS includes (Part V) prescription of exclusive economic zones (EEZs) stretching to 200 nautical miles from its coast over which a country has sovereign rights over the exploration and use of marine resources. Part XII contains provisions for protection and preservation of the marine environment including minimising pollution and preventing the introduction of invasive species.

## **INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENTS**

In 2004, the IMO adopted this Convention, which entered into force in 2017 after it was ratified by 30 states representing 35 per cent of the world's merchant shipping tonnage. It ensures the safe management of ballast water through requiring ships to have ballast management plans and detailed record keeping.

## **INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS (MARPOL)**

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The Convention includes regulations aimed at preventing and minimising pollution from ships—both accidental pollution and that from routine operations—and currently includes six technical Annexes. Special Areas with strict controls on operational discharges are included in most Annexes.

## 9. ACTION PLAN

### 9.1. THEME A Foundations

#### 9.1.1. A1 Generating support

##### A1 OUTCOME

The impacts of priority invasive species on biodiversity, economies, livelihoods, and health are widely understood, and actions to manage and reduce them are supported.

##### A1 ACTIONS

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>A1.1 Awareness and outreach programmes are designed and implemented</b>					
<b>A1.1.1</b> Promote and develop targeted communications and outreach initiatives to raise awareness and protect Tonga from the adverse impacts of invasive species (GEF 6 RIP 3.2.3)	No formalised outreach plan exists Training and awareness raising events have been held for projects at Mt Talau and Toloa National Park MAFF outreach programmes to secondary schools have included invasive species planning for billboards and brochures	Identify additional groups for awareness raising on key issues (such as biosecurity) by mid-2023 (baseline surveys of communities' invasive species awareness) Develop an outreach plan by end of 2022 Source and further develop awareness materials (pictorial factsheets in Tongan) by mid-2023 Consider animations On-going awareness programme established by the end of the GEF 6 RIP Assess effectiveness of the awareness activities (resurvey end of 2023)	GEF 6 RIP reporting NISSAP annual reporting	NISC DOE MAFF QQMD MOI – Under Marine and Ports Division MOE MCTL	GEF 6 RIP then as department funds allow Potentially PRISMSS partners to assist with survey development and sourcing awareness materials Department funding for translations

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>A1.2 Incorporate invasive species into primary and secondary education</b>					
<b>A1.2.1</b> Develop a plan for incorporating invasive species content into the school curriculum (science syllabus at primary and secondary level)	No plan for invasive species learning in the primary or secondary curricula	Agreement between MOE and MEIDECC/MAFF on content and when invasive species curriculum should be implemented in schools  High-level plan developed by end of 2022	Curriculum Plan NISSAP annual reporting	DOE MAFF QQMD Education	Department budgets/staff time or seek funding
<b>A1.2.2</b> Develop curriculum materials from existing sources and tailor to Tonga's needs. Information from other countries such as the Kiribati Year 6 invasive species curriculum (also on the Pacific Invasive Ant Toolkit) and SPREP Little Fire Ant resources may be useful	No curriculum content	Source curriculum content from partners, such as PRISMSS, regional Education departments, other NISCs, PILN, and so on by early 2023	NISSAP annual reporting	DOE MAFF MOE  Potentially PRISMSS for provision of generic materials that can be adapted to Tonga's needs	Departmental budgets/staff time or seek funding
<b>A1.2.3</b> Customise content for Tonga for invasive species topics to be taught to first classes	No curriculum content	Train teachers to deliver content by start of 2024	School curriculum NISSAP annual reporting	DOE MAFF QQMD MOE	Departmental budgets/staff time
<b>A1.2.4</b> Provide support for school excursions to Toloa RF and Mt Talau in Vava'u so that students can learn in the field	Some student outreach has occurred at Mt Toloa with Tupou College	Together with curriculum development above, work with schools to develop meaningful excursions	School curriculum NISSAP annual reporting	DOE MAFF QQMD MOE	Departmental budgets/staff time
<b>A1.3 Incorporate invasive species into tertiary and adult education</b>					
<b>A1.3.1</b> Develop a plan for incorporating invasive species content into tertiary and adult education	MAFF (and ex-MAFF lecturers) provide pest and disease management tuition for tertiary students at Hango Agricultural College, 'Eua Island	Discuss ways to enhance invasive species at tertiary institutes (initial meetings) by end of 2022  Depending on discussions, consider development of a plan by end of 2023	NISSAP Annual reporting	DOE MOE MAFF QQMD Tertiary Education Providers PRISMSS partners (to provide guidance as needed)	Departmental budgets/staff time  Potentially PRISMSS to provide generic materials that can be adapted to Tonga's needs.

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>A1.4 Government support for invasive species management is enhanced</b>					
<b>A1.4.1</b> Continue to support mechanisms that mainstream invasive species management into national decision-making processes	Invasive species are included under NBSAP for mainstreaming into national policies and frameworks TAG team indicates this is working well and incorporated into sector plans Most current NBSAP is dated 2006 and may require review	Continue support for NISSAP goals to be incorporated in national decision-making (on-going) Consideration to be given to revising a National Biodiversity Strategy and Action Plan by end of 2023	NISSAP annual reporting	DOE MAFF	Departmental budgets/staff time
<b>A1.4.2</b> Strengthen knowledge of marine invasive species in government agencies, leading to improved management and monitoring	Current knowledge of marine invasives in government agencies is limited	The Marine Biosecurity Toolkit is completed in early 2022 Share information from toolkit with government agencies by mid-2022	GEF 6 RIP reporting NISSAP annual reporting	DOE MOI Marine and Ports Division	GEF 6 for Marine Biosecurity Toolkit Department as staff time and funds allow
<b>A1.4.3</b> Ensure infrastructure developers know what actions to consider that minimise spread of invasive species	Uncertain	Develop a checklist for infrastructure developers by the end of 2022	NISSAP annual reporting	DOE PRISMSS partners (for provision of advice on best practice)	Department as staff time and funds allow
<b>A1.5 Promote awareness of marine invasive species</b>					
<b>A1.5.1</b> Derive information from the Marine Biosecurity Toolkit and make this available to those able to detect marine invasives (such as dive companies, tourists snorkelling, and those harvesting on reefs)	Little awareness of marine invasive species except Crown-of-thorns	Organisations and operators are provided with information from the Marine Biosecurity Toolkit by end of 2023	GEF 6 RIP reporting NISSAP annual reporting	DOE MOI – Marine and Ports Division	GEF 6 for Marine Biosecurity Toolkit Department as staff time and funds allow

## 9.1.2. A2 Building Capacity

### A2 OUTCOME

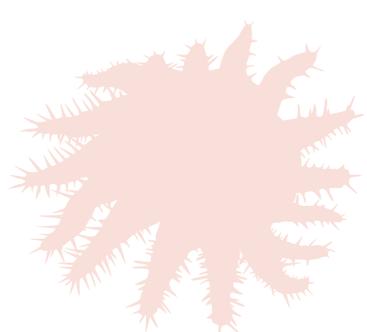
The institutions, skills, infrastructure, technical support, information management, networks and exchanges required to manage invasive species effectively are developed

### A2 ACTIONS

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>A2.1 A National Invasive Species Coordinator (NISC) role is supported</b>					
<b>A2.1.1</b> Ongoing support of the National Invasive Species Officer and activities as a core position of MEIDECC following completion of GEF 6 RIP	NISC position was established to coordinate activities in 2018 under Tonga's GEF-PAS invasive species project and is being supported by the GEF 6 RIP	Maintain at least one NISC position as funding allows	NISSAP annual reporting	MEIDECC	GEF 6 RIP until 2024 MEIDECC
<b>A2.1.2</b> Information is shared by the NISC with a list of stakeholders in the department (including outer islands staff) and outside the department (other departments, community groups, and so on)	Ad-hoc process for information sharing	Information is forwarded to stakeholders consistently by end of 2022	NISSAP annual reporting	NISC MOE	GEF 6 RIP until 2024 MEIDECC
<b>A2.2 A multi-sectoral national Technical Advisory Group (TAG) is formed</b>					
<b>A2.2.1</b> Regular TAG meetings to discuss cross-sectoral invasive species issues and enhance cross-sectoral support (GEF 6 RIP Tonga 1.1.1)	TAG was established under first NISSAP	Meetings are regularly held, and minutes are kept	GEF 6 RIP reporting Minutes of TAG meetings NISSAP annual reporting	NISC TAG members	GEF 6 RIP until 2024
<b>A2.2.2</b> Continue support of the TAG after completion of GEF 6 RIP	TAG established under first NISSAP	Maintain this multi-sectoral invasives species team and encourage activities  As funding allows	Minutes of TAG meetings NISSAP annual reporting	NISC TAG members	Cost-shared by TAG member departments as funds allow

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>A2.3 Capability needs are identified for invasive species management (including biosecurity) and training plans implemented</b>					
<p><b>A2.3.1</b> Identify gaps in the current national capability to implement the components of this NISSAP</p> <p>Identify skills existing within members of the TAG, the skills necessary to have in-country, and skills that need to be filled from outside Tonga</p> <p>Identify means to strengthen capability and training where needed</p>	<p>Some training needs have been identified for weed control using chemicals and for site survey assessments</p>	<p>Use the PRISMSS capability framework (due for completion in early 2022) to identify training needs by mid-2022</p>	<p>Capability matrix prepared for Tonga NISSAP annual reporting</p>	<p>DOE MAFF QQMD PRISMSS partners (to assist with capability framework and capability development)</p>	<p>Departmental budgets GEF 6 RIP MISCCAP</p>
<p><b>A2.3.3</b> Pursue accredited qualifications for staff</p> <p>Investigate invasive species qualifications available around the region (use existing contacts at universities, invasive species networks, through PRISMSS)</p>	<p>No staff have invasive species specialist qualifications</p>	<p>New qualifications achieved by staff during life of new NISSAP (will depend on individual training plans and qualifications desired and available)</p>	<p>NISSAP annual reporting</p>	<p>MEIDECC MAFF PRISMSS partners may be able to offer suggestions</p>	<p>To be determined</p>
<p><b>A2.3.4</b> Capability to survey and identify marine invasives</p>	<p>No staff have marine invasives survey expertise</p>	<p>Use information from Marine Biosecurity Toolkit by early 2022</p> <p>Identify any additional training needs by late 2022</p>	<p>NISSAP annual reporting</p>	<p>Marine and Ports (MOI) Fisheries DOE MAFF Fisheries Ports Authority Tonga Consultants (Marine Biosecurity Toolkit)</p>	<p>GEF 6 RIP (for development of Marine Biosecurity Toolkit) Department budgets</p>
<p><b>A2.3.5</b> Train quarantine staff in identification of potential new invasive species focusing on Tongan priorities for EDRR, such as reptiles and amphibians, invasive plants, mongoose, fire ants, snails, and invasive birds (GEF 6 RIP 3.1.1)</p>	<p>Internal training of MAFF is completed annually, and training is completed for new staff when they are recruited</p> <p>Training has been conducted for some priority species (such as red imported fire ants)</p>	<p>Continue to train new quarantine staff annually</p> <p>Training in identification of priority species by end of GEF 6 RIP</p>	<p>GEF 6 RIP reporting NISSAP annual reporting</p>	<p>MAFF QQMD</p>	<p>Departmental staff time for internal training GEF 6 RIP for training in identification of priority species</p>

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>A2.4 Structured national invasive species / biosecurity annual work programmes implemented</b>					
<b>A2.4.1</b> Annual work programmes defined, including monitoring and reporting	Structured international and domestic biosecurity work programmes are in place  Some invasive species work programmes are in place, but some needs are either unstructured, not resourced or not financed	Structured invasive species work programmes are in place by the end of 2022	GEF 6 RIP reporting  NISSAP annual reporting	NISC MAFF PRISMSS support	GEF 6 RIP for defining work programmes
<b>A2.4.2</b> Invasive species work programmes supported after the end of GEF 6 RIP	Invasive species work is conducted reactively rather than proactively	Structured invasive species work programmes are in place after GEF 6 RIP project ends	GEF 6 RIP reporting  NISSAP annual reporting	NISC MEIDECC PRISMSS support	Ongoing department budgets and staff time
<b>A2.5 Funding is available to carry out the NISSAP activities</b>					
<b>A2.5.1</b> Implement long-term funding mechanisms to ensure the implementation of this strategy using the guidance from GEF 6 RIP Sustainable Funding activity (GEF 6 RIP 4.1.2)	Tonga is reliant on outside funding for invasive species work	Long-term funding plan is designed using the GEF 6 RIP Sustainable Funding guidelines by 2023	GEF 6 RIP reporting  NISSAP annual reporting	MEIDECC MAFF SPREP	GEF 6 RIP (for Sustainable Funding guidelines) Other donors
<b>A2.6 Participation in knowledge-sharing through PILN meetings and communications</b>					
<b>A2.6.1</b> Continue membership of PILN	MEIDECC staff became members of PILN from 2015	NISC to attend PILN Meetings and share knowledge from activities in Tonga	GEF 6 RIP reporting  NISSAP annual reporting	NISC SPREP	GEF 6 RIP to fund PILN meeting attendance



**A2.7 Tonga’s biosecurity and invasive species management facilities are fit-for-purpose**

<p><b>A2.7.1</b> Maintain a list of existing equipment and facilities currently available for invasive species management and identify additional needs</p>	<p>No list has been prepared for invasive species management needs</p> <p>The nursery at the Toloa Rainforest is used effectively for growing plants</p> <p>A pig-proof fence at Mt Talau is working as intended to exclude pigs from a key biodiversity site</p> <p>Facilities at MAFF Vaini for NENS work include a shadehouse, post-entry quarantine/lab, and equipment</p>	<p>Prepare a list of equipment and infrastructure requirements for invasive species management and identify gaps by end of 2022</p>	<p>NISSAP annual reporting</p>	<p>NISC DOE</p>	<p>Departmental budgets</p> <p>Potentially GEF 6 RIP for improving priority facilities and equipment</p> <p>Other financing to be identified based on list of needs</p>
<p><b>A2.7.2</b> Ensure biosecurity equipment and facilities are fit for purpose See also EDRR (C1.1)</p>	<p>A MAFF QQMD list of equipment needs has been prepared</p> <p>Currently secure quarantine facilities are at MAFF Research Centre at Vaini</p> <p>Quarantine staff have requested equipment from government budget, including an X-ray machine for ports and post-border facilities</p>	<p>If existing project and government budgets are insufficient, develop a proposal to enhance facilities through bilateral or multi-lateral funding streams by end of 2023</p>	<p>NISSAP annual reporting GEF 6 RIP reporting</p>	<p>MAFF QQMD PRISMSS POI (to assist as needed)</p>	<p>GEF 6 RIP (X-ray at Fua’amotu)</p> <p>SAFE Pacific (X-ray at Vava’u)</p> <p>PACER PLUS (Incinerator)</p> <p>Departmental budgets</p> <p>Other financing to be identified based on list of needs</p>



## 9.1.3. A3 Legislation, policy, and protocols

### A3 OUTCOME

Appropriate legislation, policies, protocols, and procedures are in place and operating, to underpin the effective management of invasive species

### A3 ACTIONS

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>A3.1 Review and revise NISSAP for Tonga</b>					
<b>A3.1.1</b> NISSAP reviewed for Tonga (GEF 6 RIP Tonga 1.1.3)	Tonga's first NISSAP expired 2021	NISSAP reviewed in 2021	GEF 6 RIP reporting NISSAP annual reporting	NISC MEIDECC SPREP Consultants	GEF 6 RIP
<b>A3.1.2</b> Revised NISSAP developed	Tonga's first NISSAP expired 2021	NISSAP revised in 2021 New NISSAP endorsed in 2021	GEF 6 RIP reporting NISSAP annual reporting	Consultants NISC SPREP PRISMSS Partners	GEF 6 RIP
<b>A3.1.3</b> Monitor NISSAP progress	No monitoring of the NISSAP is currently undertaken, only a review at the end of the NISSAP term	Completion of NISSAP annual reporting	GEF 6 RIP reporting NISSAP annual reporting	NISC SPREP	GEF 6 RIP MEIDECC after completion of GEF 6 RIP
<b>A3.1.4</b> Review NISSAP and revise	This NISSAP	Mid-term review and initiation of revised NISSAP by 2025	NISSAP annual reporting	MEIDECC	To be determined
<b>A3.2 Biosecurity legislation is fit-for-purpose</b>					
<b>A3.2.1</b> A Biosecurity Bill to be enacted to ensure Tonga's legislation is harmonised with the rest of the region and fit-for-purpose for Tonga (GEF 6 RIP)	Biosecurity Bill was first proposed in 2007 and reviewed through GEF 6 RIP Consultation has not been undertaken for the Bill, which is a requirement for new laws in Tonga	Determine what is needed to ensure the Biosecurity Bill is fit-for-purpose for Tonga and have new Biosecurity Bill passed by the end of GEF 6 RIP (2024)	Revised legislation NISSAP annual reporting	MEIDECC MAFF	GEF 6 RIP (for biosecurity legislation review and support) Departmental budgets

## 9.2. THEME B Problem definition, prioritisation and decision-making

### 9.2.1. B1 Baseline & Monitoring

#### B1 OUTCOME

Systems are in place to generate baseline information on the status and distribution of invasive species and to detect changes, including range changes and emerging impacts

#### B1 ACTIONS

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>B1.1 Biodiversity baseline surveys (marine and terrestrial) established and repeated as required</b>					
<b>B1.1.1</b> Conduct regular biodiversity surveys Establish a programme for detecting change in the status and distribution of invasive species (using iNaturalist and GBIF) Provide lists to survey team of invasive species and their identification for biodiversity checklists	A survey of 4 islands in Ha'apai group was completed in 2020 (Refer detail in C3.3) Preliminary planning has been completed for future surveys of Vava'u and Tongatapu	Record results of all surveys to date in iNaturalist POI project (new invasive species) and GBIF for existing invasives by end of 2022 Use Ha'apai survey results to establish the baseline for programme to detect change Complete surveys of Vava'u and Tongatapu islands when CovidCOVID-19 response allows Aim to repeat surveys in first quarter of 2022 and at least every five years Obtain species identification tools (including Marine Biosecurity Toolkit) by end of 2022	NISSAP annual reporting	NISC DOE MAFF Fisheries and QQMD MOI PRISMSS partners (for invasive species identification tools) Marine Biosecurity Toolkit	GEF 6 RIP Departmental budgets (for maintaining baseline information (data and reports) Additional funding to conduct surveys to be identified
<b>B1.1.2</b> Survey of Nuku'alofa, Vava'u and Ha'apai Ports for marine invasives Using the results, prioritise marine invasives actions for Nuku'alofa, Vava'u and Ha'apai	No marine invasives baselines	Surveys of marine invasives subject to funding Use Marine Biosecurity Toolkit for identifications Prioritise marine invasives actions based on survey results	Report on Port surveys NISSAP annual reporting	Marine and Ports (MOI) DOE MAFF Fisheries Ports Authority Tonga	GEF 6 RIP (for Marine Biosecurity Toolkit) Funding for surveys to be determined

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>B1.2 Collection and sharing of biodiversity information</b>					
<b>B1.2.1</b> Promote PBIF as a tool for use by communities and schools to improve collection of occurrence information and identification of invasive species	On 8 April 2022, there were 72,678 records for Tonga in GBIF and 7,973 occurrences originated from within Tonga	Promote use of the app through networks (schools, government departments, and so on)	NISSAP annual reporting	NISC	DOE department funding
<b>B1.2.2</b> Make biodiversity information publicly available via PBIF/GBIF	On 8 April 2022, there were 72,678 records for Tonga in GBIF	Publish any data that arise from the activities of DOE	NISSAP annual reporting	DOE	GBIF DOE department funding

## 9.2.2. B2 Prioritisation

### B2 OUTCOME

Effective systems are established and implemented to assess risk and prioritise invasive species for management.

### B2 ACTIONS

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>B2.1 Risk profiles for the most important invasive species threats completed</b>					
<b>B2.1.1</b> Risk profiles (pathways, mitigation plans, rank order of species) for the most important threats completed (GEF 6 RIP 2.1.2): terrestrial species	Pathways identified and eight terrestrial species prioritised (See Annex 2)	EDRR Plan completion for eight threat species by end of 2022 (see C1.3)	GEF 6 RIP reporting NISSAP annual reporting	MAFF Fisheries MAFF QQMD PRISMSS POI (Pacific Biosecurity) PRISMSS Partners (support)	GEF 6 RIP
<b>B2.1.2</b> Marine invasive species risk profiles are known, particularly focussed on protected areas (GEF 6 RIP 2.1.2)	No profiles for marine invasives (see also B1.1) for surveys	Use Marine Biosecurity Toolkit for risk assessment	GEF 6 RIP reporting NISSAP annual reporting	MAFF Fisheries	GEF 6 RIP
<b>B2.1.3</b> Use ISSG's desktop survey and information from PRISMSS partners and other experts to identify external threats coming and implement appropriate pre-border and at-border interventions for priority invasive species (see also EDRR C1.1)	Desktop review is being used along with past specialist advice on priorities (also refer B2.1 #1)	Continue to use desktop surveys to inform risk assessment	Assessments completed NISSAP annual reporting	MAFF QQMD DOE to work with MAFF Research PRISMSS support (advice as needed)	Departmental budgets

## 9.2.3. B3 Research on priorities

### B3 OUTCOME

Knowledge is updated for priority invasive species, including species biology and impacts, and development of effective management techniques.

### B3 ACTIONS

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>B3.1 Use available research to guide prevention and management of priority species</b>					
<b>B3.1.1</b> Keep up to date with knowledge through subscribing to email lists (such as PestNet and Aliens-List), taking part in PILN meetings, and seeking information through PRISMSS partners	Available research is used as needed. Not all applicable lists are subscribed to	Continue using research and subscribe to all lists by early 2022	NISSAP annual reporting	NISC DOE PRISMSS partners (for support)	Department budget as part of normal duties



## 9.3. THEME C Management action

### 9.3.1. C1 Biosecurity

#### C1 OUTCOME

Mechanisms are established to prevent the spread of invasive species across international or internal borders and quickly detect and respond to those that arrive.

#### C1 ACTIONS

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>C1.1 EDRR implemented for priority invasive species not yet in Tonga</b>					
<b>C1.1.1</b> EDRR plans and protocols written for at least three priority high-risk groups in priority sites (GEF 6 RIP 3.1.2)	Tonga has no general ERP for plant pests Surveillance is undertaken for fruit fly in Tongatapu	Develop endorsed EDRR plan for three highest-priority invasive species by beginning of 2022	GEF 6 RIP reporting NISSAP annual reporting	MAFF QQMD and Research DOE (supporting) MOI (supporting) (Pacific Biosecurity – plan development)	GEF 6 RIP
<b>C1.1.2</b> Develop a list of pesticides that may be required for invasive species incursions (GEF 6 RIP 3.1.2)	MAFF have a list of currently registered pesticides. Pesticide Regulations were submitted to Cabinet in 2022 Pesticide requirements for EDRR are not yet known	Once Pesticide Regulations are past and EDRR requirements known, cross-check all pesticides that may need to be imported for EDRR with registered pesticide list Update regulations if needed Undertake EIA for any new requirements so that these pesticides by end of 2022	GEF 6 RIP reporting NISSAP annual reporting	MEIDECC MAFF QQMD PRISMSS partners (to provide lists of pesticides and assist with EIA)	Departmental budgets GEF 6 RIP for EDRR
<b>C1.1.3</b> EDRR specialist equipment bought (GEF 6 RIP 3.1.2)	Tonga does not have specialist equipment for priority species	Specialist equipment delivered to Tonga by the end of 2022 or sooner, COVID-19 restrictions permitting	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS POI (Pacific Biosecurity)	GEF 6 RIP

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>C1.1 EDRR implemented for priority invasive species not yet in Tonga</b>					
<b>C1.1.4</b> EDRR training completed for the three priority species (GEF 6 RIP 3.1.2)	No training undertaken	Training undertaken by the end of 2022 or sooner, COVID-19 response permitting	GEF 6 RIP reporting NISSAP annual reporting	NISC PRISMSS POI (Pacific Biosecurity) NISC MAFF QQMD and Research DOE (supporting) MOI (supporting)	GEF 6 RIP
<b>C1.1.5</b> Initial simulation exercises run for the three priority species and assessments completed (GEF 6 RIP 3.1.2)	No simulation exercises completed	Exercise completed as part of training in C1.1 #4	GEF 6 RIP reporting NISSAP annual reporting	NISC PRISMSS POI (Pacific Biosecurity) NISC MAFF QQMD and Research DOE (supporting) MOI (supporting)	GEF 6 RIP
<b>C1.1.6</b> On-going surveillance for the three priority EDRR species and others if possible (GEF 6 RIP 2.1.2)	Surveillance not currently undertaken for the priority invasive species  Surveillance is undertaken for fruit flies	Regular surveillance in place by mid-2023	GEF 6 RIP reporting NISSAP annual reporting	MAFF Research	GEF 6 RIP (for surveillance of priority EDRR species)  MAFF funding after GEF 6 RIP as funds allow
<b>C1.1.7</b> Tailor SPC general ERP for crop pests (GEF 6 3.1.2)	No general ERP is in place for Tonga	Adopt ERP by end of 2022	NISSAP annual reporting	MAFF (Quarantine Division and Research Division) MEIDECC MOI (supporting) PRISMSS POI (for support)	MAFF funding as funds allow
<b>C1.1.8</b> Road-based surveys for weeds on the three main islands of Tonga	No surveillance for weeds has been undertaken	Development of a War on Weeds programme for Tonga by the end of the GEF 6 RIP	GEF 6 RIP reporting NISSAP annual reporting	NISC PRISMSS WOW (for support for identifications)	GEF 6 RIP

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>C1.2 Domestic and International invasive species pathways secured</b>					
<b>C1.2.1</b> Pathways (across national boundaries and inter-island) identified (GEF 6 RIP 3.1.1)	Pathways have been identified by ISSG Eight priority international species/taxa have been identified for EDRR	Ongoing assessment of risk species and pathways to identify emerging threats	GEF 6 RIP reporting NISSAP annual reporting	MAFF QQMD, Research and Extension DOE PRISMSS partners (support for risk assessment)	GEF 6 RIP
<b>C1.2.2</b> Biosecurity gap analysis (GEF 6 RIP 3.2.2)	Biosecurity gaps not fully known (for example, domestic pathways not secured for specific species)	Biosecurity gaps identified by June 2022 Timeframe depending on COVID	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS PFP (Island Conservation) MAFF QQMD, Research and Extension DOE	GEF 6 RIP
<b>C1.2.3</b> Depending on gap analysis, develop protocols and implement biosecurity enhancements (GEF 6 RIP 3.1.1)	Depending on gap analysis	Protocols developed by 2023	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP to lead implementation MAFF QQMD, Research and Extension PRISMSS POI (Pacific Biosecurity) PRISMSS Partners (support)	GEF 6 RIP
<b>C1.3 Marine and terrestrial (including weeds) invasive species surveillance programmes designed and operational</b>					
<b>C1.3.1</b> Priority marine species for surveillance identified (GEF 6 RIP 2.1.1 and GEF 6 RIP 2.1.2) using the Marine Biosecurity Toolkit Marine Biosecurity Toolkit identifies 25 highest priority species	Terrestrial priority species have been identified (C1 2) but marine species not yet prioritised	Identify marine priority species by end of 2022	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS Partners (support) Ministry of Fisheries and MOI	GEF 6 RIP (Marine Biosecurity Toolkit) Ministry of Fisheries budget after GEF 6 RIP as funds allow
<b>C1.3.2</b> Surveillance programmes designed and tested for marine species (GEF 6 RIP 2.1.2)	No surveillance being undertaken for marine species	Once marine species prioritised, design and test surveillance programme by end of 2023	GEF 6 RIP reporting NISSAP annual reporting	Ministry of Fisheries	GEF 6 RIP (Marine Biosecurity Toolkit) Ministry of Fisheries after GEF 6 RIP as funds allow
<b>C1.3.3</b> Surveillance programmes operational for marine species (GEF 6 RIP 2.1.2)	No surveillance being undertaken for marine species	Marine surveillance programme operational from beginning of 2023	GEF 6 RIP reporting NISSAP annual reporting	Ministry of Fisheries	GEF 6 RIP (Marine Biosecurity Toolkit) Ministry of Fisheries after GEF 6 RIP as funds allow

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>C1.4 Increase biosecurity awareness</b>					
<b>C1.4.1</b> Source awareness material (such as posters) to help both frontline quarantine staff and business sectors (such as tourism and importers) and share invasive species lists with stakeholders  Translations of regional material may be useful	Some brochures have been externally sourced	New awareness material deployed from 2022  Promote GBIF to stakeholders	NISSAP annual reporting	DOE MAFF QQMD PRISMSS partners (to provide existing awareness materials)	GEF 6 RIP Departmental staff time
<b>C1.4.2</b> Circulate awareness material among community and other internal stakeholders that focuses on prevention of invasive species movement between islands – includes rats, weeds, invasive ants, and others such as feral pigeons which are currently confined to Tongatapu	Domestic biosecurity and awareness currently limited	Begin raising awareness and establishing protocols with associated training from 2022	NISSAP annual reporting	MAFF Ports MEIDECC PRISMSS support (advice)	Departmental staff time
<b>C1.4.3</b> Develop protocols to assist business and tourism operators with inter-island biosecurity addressing exclusion of the target invasive species groups identified above	Domestic biosecurity and awareness not in place	Develop protocols and integrate training with initiatives above	Protocols developed NISSAP annual reporting	MAFF MEIDECC PRISMSS support (advice)	GEF 6 RIP (biosecurity protocols) Departmental staff time



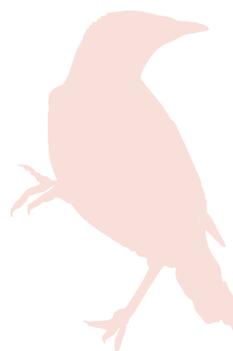
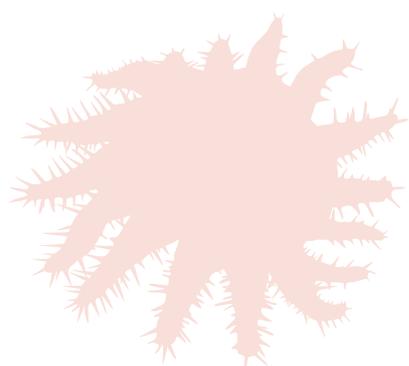
## 9.3.2. C2 Management of established invasives

### C2 OUTCOME

The impacts of priority established invasive species are eliminated or reduced by eradicating or controlling the target species.

### C2 ACTIONS

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>C2.1 Rodent eradication plan implemented for priority islands</b>					
<b>C2.1.1</b> Complete rodent eradications on at least four islands in Ha'apai and Vava'u Groups to develop capacity (GEF 6 RIP 3.2.2)	Four islands in Ha'apai islands have been surveyed and prioritised for training and rat eradication (feasibility study and prioritisation are complete)	Rats eradicated from four islands by the end of 2023 (depending on COVID-19 pandemic situation)	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS PFP (Island Conservation) NISC DOE MAFF	GEF 6 RIP
<b>C2.1.2</b> Complete eradications of Pacific rats and other invasive species on Late Island (1,731 ha) in Vava'u	Feasibility assessment and operational plans are complete for Late Island (see Island Conservation 2014, undated)	Rats eradicated from Late by the end of 2024 and rats, pigs, and ungulates from Tofua, Kao and 'Ata by 2028 (depending on COVID-19 pandemic situation)	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS PFP (Island Conservation) NISC DOE	GEF 6 RIP
<b>C2.1.3</b> Ongoing monitoring post-rodent eradications (GEF 6 RIP 3.2.2)	No eradications have been undertaken	Ongoing monitoring finds no evidence of rodents and documents the outcomes of rodent eradication	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS PFP (Island Conservation) NISC DOE MAFF	GEF 6 RIP



ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>C2.2 Species-led biological control for invasive plants</b>					
<b>C2.2.1</b> At least three weed biological control programmes researched and established (GEF 6 RIP 3.1.2)	Three plants of concern assessed as likely to be suitable for NENS	Complete implementation of three programmes by end of GEF 6 RIP (timing subject to COVID-19 pandemic)	GEF 6 reporting NISSAP annual reporting	PRISMSS NENS NISC DOE	GEF 6 RIP MISCCAP
<b>C2.2.2</b> Air Potato Beetle ( <i>Liliocheris chen</i> ) programme for Air Potato	No biocontrol for Air Potato	Released in Tonga by April 2023 if testing shows it is suitable for Tonga	MISCCAP reporting NISSAP annual reporting	NISC DOE PRISMSS NENS	MISCCAP
<b>C2.2.3</b> African Tulip Tree Mite ( <i>Colomerus spathodae</i> ) for African Tulip Tree	No biocontrol for African Tulip Tree	Released in Tonga by April 2023	MISCCAP reporting NISSAP annual reporting	NISC DOE PRISMSS NENS	MISCCAP
<b>C2.2.4</b> Broomweed Beetle ( <i>Calligrapha pantherina</i> ) programme for Broomweed and Arrow-leaved Sida ( <i>Sida</i> spp.) (GEF 6 RIP 3.1.2)	No biocontrol for <i>Sida</i> spp.	Imported by end of 2021 if testing shows it is suitable for Tonga	GEF 6 RIP reporting NISSAP annual reporting	NISC DOE PRISMSS NENS	GEF 6 RIP
<b>C2.2.5</b> Taro Vine, Turkeyberry, and Mile-a-minute biocontrol programmes	No biocontrols currently available or no funding to implement	Review availability of biocontrols and potential funding by the end of 2026	MISCCAP reporting NISSAP annual reporting	NISC DOE PRISMSS NENS (for support)	Funding to be determined
<b>C2.3 Species-led weed control programmes</b>					
<b>C2.3.1</b> Species-led weed control plans developed for at least three weed species (GEF 6 RIP 2.1.2)	No weed control plans in place	Prioritise species for weed control programmes by end of 2022  Implement three weed control programmes by conclusion of GEF 6 RIP (timing dependent on COVID-19 pandemic situation)	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS WOW DOE MAFF Communities	GEF 6 RIP
<b>C2.3.2</b> Species-led weed control plans implemented (GEF 6 RIP 2.1.2)	No weed control plans in place	Timeframe dependent on COVID	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS WOW DOE MAFF Communities	GEF 6 RIP
<b>C2.3.3</b> Ongoing monitoring after weed control (GEF 6 RIP 2.1.2)	No weed control plans in place	Ongoing monitoring finds reduction in weed prevalence	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS WOW DOE MAFF Communities	GEF 6 RIP Department funding and community in-kind contributions for on-going monitoring

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
<b>C2.4 Yellow Crazy Ant management</b>					
<b>C2.4.1</b> Monitor Yellow Crazy Ants at high priority sites like Mt Talau, Toloa Rainforest, and 'Eua National Park (if the ants are present)	Surveys were undertaken in the past, but results are not known No local skills in ant surveys or control	Set up a monitoring plan by end of 2023 As part of EDRR, organise training in monitoring Yellow Crazy Ants (COVID-19 response permitting)	NISSAP annual reporting	MEIDECC MAFF Community PRISMSS POI (Pacific Biosecurity for training and assistance with plan)	GEF 6 RIP Department funding and community in-kind contributions for on-going monitoring
<b>C2.5 Control of feral pigeons</b>					
<b>C2.5.1</b> Evaluate impact and feasibility of control to reduce numbers and prevent spread of feral pigeons	Impacts, abundance, and distribution not quantified	Identify options for pigeon control by end of 2023 (through EDRR for invasive birds)	NISSAP annual reporting	DOE MAFF Community Ministry of Health PRISMSS (advice on control)	Funding to be determined to identify impacts, distribution, and abundance (potentially also a school project)
<b>C2.6 Crown-of-thorns on-going control (mainly in Vava'u)</b>					
<b>C2.6.1</b> Crown-of-thorns control plan developed (monitoring, triggers for control, protocols for control)  Native crown-of-thorns (and native algae) outbreaks are typically due to nutrient addition (waste), so waste monitoring and/or management should be incorporated in the plan	No specific control plans in place	Plan developed by end of 2022	NISSAP annual reporting	Marine and Ports (MOI) DOE Ministry of Fisheries Community PRISMSS (advice on control)	Community-led initiative supported by Government stakeholders
<b>C2.6.2</b> Monitor status of crown-of-thorns and control as needed	No specific control plans in place	Crown-of-thorns prevalence declines and need for monitoring decreases	NISSAP annual reporting	Marine and Ports (MOI) DOE Ministry of Fisheries Community	Community-led initiative supported by Government stakeholders

### 9.3.3. C3 Restoration

#### C3 OUTCOME

Following invasive species management, the best methods are determined and implemented to facilitate effective restoration of native biodiversity or recovery of other values.

#### C3 ACTIONS

ACTIVITIES	BASELINE	TARGETS	VERIFICATION	RESPONSIBILITY	FINANCING
<b>C3.1 Toloa Rainforest restoration Project</b>					
<p>Toloa Rainforest restoration focuses on:</p> <ul style="list-style-type: none"> <li>weed management;</li> <li>pig management;</li> <li>rat management;</li> <li>monitoring of invasive and native species;</li> <li>supporting the Toloa Rainforest nursery and identifying if any upgrades are needed;</li> <li>expanding forest footprint; and</li> <li>increasing native biodiversity</li> </ul>	<p>Toloa Rainforest Restoration Project has a draft Operational Plan 2014–20</p> <p>Toloa Rainforest – community training was delayed by COVID-19 pandemic but was completed in early 2021</p>	<p>Continue with invasive species management and monitoring in 2022 as per the Operational Plan</p> <p>Record results of surveys in iNaturalist POI project (new invasive species) and GBIF</p>	<p>NISSAP annual reporting</p> <p>Monitoring results are documented as part of Operational Plan</p> <p>iNaturalist and GBIF records</p>	<p>MEIDECC</p> <p>MAFF</p> <p>Tupou College (Stewards of the Toloa Rainforest) and Tupou school have key leadership roles on site</p> <p>PRISMSS RERC (for support)</p>	<p>GEF 6 RIP</p>
<b>C3.2 Pilot a community-led eco-experience</b>					
<p><b>C3.2.1</b> Enable school communities to use Toloa Rainforest as a field site for invasive species awareness, developing science and practical skills</p> <p>Providing facilities at Toloa RF would improve access:</p> <p>Canopy walk to enable study of the rainforest canopy</p> <p>Toilet facilities</p> <p>Access walkways</p> <p>There may be potential to develop this into an eco-tourism venture and use it as a proof-of-concept for greater engagement by schools and the wider community in biodiversity</p>	<p>Operational plan for the Toloa Rainforest Restoration Project is complete (Atherton 2014)</p> <p>Tupou School Principal is supportive and engaged</p> <p>No facilities in place</p>	<p>Support ongoing participation of schools, school projects</p> <p>Develop a proposal for funding for facilities by end of 2022</p> <p>Ensure student survey records are lodged in GBIF (and consider if they can enter the records themselves)</p>	<p>NISSAP annual reporting</p> <p>School reports</p> <p>GBIF records</p>	<p>MEIDECC</p> <p>School principals</p> <p>PRISMSS RERC (to assist with developing a proposal for facilities)</p>	<p>Funding to be determined</p>

ACTIVITIES	BASELINE	TARGETS	VERIFICATION	RESPONSIBILITY	FINANCING
<b>C3.3 'Eua National Park restoration project</b>					
<b>C3.3.1</b> Work with community to implement this project. The project scope includes: fencing to exclude pigs and domestic stock; surveys to identify opportunities to manage invasive species and protect biodiversity; weed management for ecosystem health; rat management for ecosystem and species; pig management for ecosystem and species; and integrated plan	Planning for the survey with the community was completed, but implementation is delayed by the COVID-19 pandemic	Surveys are planned for 2022 and a management plan will be completed after the survey Complete management plan by end of 2023 Survey records are lodged in GBIF	'Eua National Park Plan NISSAP annual reporting GBIF records	MEIDECC MAFF PRISMSS support (developing management plan)	Some under GEF 6 RIP Sustainable on-going funding to be determined
<b>C3.4 Incorporate coastal ecosystems into restoration planning</b>					
<b>C3.4.1</b> Identify coastal ecosystems for priority restoration	No baseline	Incorporate invasive species into coastal ecosystem surveys by 2023	NISSAP annual reporting	MEIDECC MAFF VEPA (supporting) PRISMSS support (advice)	Departmental budget Additional funding to be determined
<b>C 3.5 Mt Talau National Park restoration</b>					
<b>C3.5.2</b> Work with Utu Vava'u community and VEPA for implementation of this biodiversity project including: fence maintenance and monitoring for pig exclusion; rat management for ecosystem and species; weed control for ecosystem health; mapping of forestry boundaries; eco-tourism/sustainable financing for the Mt Talau communities; and access points needed for the community Further community consultation and national body support and coordination is needed to develop this project Monitoring results could be shared using INFORM and/or GBIF	Baseline monitoring is conducted by VEPA monthly Fence is constructed	Continue with monitoring Develop plan and proposal for eco-tourism/sustainable financing by the end of 2023 Ensure survey records are lodged in GBIF	VEPA reports NISSAP annual reporting GBIF records	DOE MAFF VEPA (supporting) Vava'u community PRISMSS RERC (support and assistance to develop funding applications)	Some under GEF 6 RIP Community in-kind time and labour Sustainable on-going funding to be determined

ACTIVITIES	BASELINE	TARGETS	VERIFICATION	RESPONSIBILITY	FINANCING
<b>C3.6 New site restoration programmes</b>					
<b>C3.6.2</b> At least three priority sites selected for weed control programmes (GEF 6 RIP 2.1.2)	No priority sites selected for weed control programmes	Prioritise sites for weed control programmes by end of 2022 Implement three weed control programmes by conclusion of GEF 6 RIP (timing dependent on COVID-19 situation)	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS RERC DOE MAFF Communities	GEF 6 RIP
<b>C3.6.2</b> Weed control plans implemented at priority sites (GEF 6 RIP 2.1.2)	No weed control programmes in place	(Timeframe dependent on COVID-19 pandemic situation)	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS RERC DOE MAFF Communities	GEF 6 RIP
<b>C3.6.3</b> Ongoing monitoring after weed control (GEF 6 RIP 2.1.2)	No weed control programmes in place	Ongoing monitoring finds reduction in weed prevalence	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS RERC DOE MAFF Communities	GEF 6 RIP Department funding and community in-kind contributions for on-going monitoring





## 10. MONITORING AND EVALUATION

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MEIDECC has the role of coordinating the monitoring and evaluation of the implementation of this strategy.

### MONITORING – NISSAP ANNUAL REPORTING

An annual review of activities in the Action Plan is required, with the involvement of the Technical Advisory Group. The NISSAP annual reporting requires only completion of the monitoring template as shown on the following page and is prompted by SPREP at the same time as the Guidelines Reporting updates. Ideally, any reports that have been produced should also be sent out with the completed monitoring template.

Once the annual review is complete, it is shared with SPREP and SPC. Monitoring assesses progress using the baselines, targets, and verification (indicators) identified in the Action Plan tables. Monitoring identifies issues that might affect the success of the activities and provides an opportunity to adapt to changing conditions.

Any additional work that contributes to the NISSAP goals but was not identified in the Action Plan should also be recorded.

### EVALUATION

Halfway through the NISSAP timeframe, a *mid-term review* should be undertaken, and a final review should occur at the end of the NISSAP timeframe. The *final review* may be undertaken as part of the preparation for the updated NISSAP. The purpose of the reviews is to compare the expected progress with actual outcomes. The reviews are undertaken by the agency responsible for the implementation of the NISSAP as well as the Technical Action Group, with contributions and guidance from SPREP and SPC.

The evaluation should include a review of the monitoring reports to date. The mid-term review should identify areas that will likely be carried forward to the next NISSAP, for which funding should be sought, so that the work to secure funding can commence.

## MONITORING TEMPLATE

This template should be completed every year for NISSAP annual reporting. The Actions from the Action Tables are included on the left. Each year, status information is added to the right-hand columns.

ACTIONS	2022	2023	2024	2025	2026
<b>A1.1</b> Awareness and outreach programmes are designed and implemented					
<b>A1.2</b> Incorporate invasive species into primary and secondary education					
<b>A1.3</b> Incorporate invasive species into tertiary and adult education					
<b>A1.4</b> Government support for invasive species management is enhanced					
<b>A1.5</b> Promote awareness of marine invasive species					
<b>A2.1</b> A National Invasive Species Coordinator (NISC) role is supported					
<b>A2.2</b> A multi-sectoral national Technical Advisory Group (TAG) is formed					
<b>A2.3</b> Capability needs are identified for invasive species management (including biosecurity) and training plans implemented					
<b>A2.4</b> Structured national invasive species/biosecurity annual work programmes implemented					
<b>A2.5</b> Funding is available to carry out the NISSAP activities					
<b>A2.6</b> Participate in knowledge sharing through PILN meetings and communications					
<b>A2.7</b> Tonga's biosecurity and invasive species management facilities are fit-for-purpose					
<b>A3.1</b> Review and revise NISSAP for Tonga	<i>Not applicable</i>	<i>Not applicable</i>	<i>Not applicable</i>	<i>Not applicable</i>	
<b>A3.2</b> Biosecurity legislation is fit-for-purpose					
<b>B1.1</b> Biodiversity baseline surveys (marine and terrestrial) established and repeated as required					

ACTIONS	2022	2023	2024	2025	2026
<b>B1.2</b> Collection and sharing of biodiversity information					
<b>B2.1</b> Risk profiles for the most important invasive species threats completed					
<b>B3.1</b> Use available research to guide prevention and management of priority species					
<b>C1.1</b> EDRR implemented for priority invasive species not yet in Tonga					
<b>C1.2</b> Domestic and International invasive species pathways secured					
<b>C1.3</b> Marine and terrestrial (including weeds) invasive species surveillance programmes designed and operational					
<b>C1.4</b> Increase biosecurity awareness					
<b>C2.1</b> Rodent eradication plan implemented for priority islands					
<b>C2.2</b> Species-led biological control for invasive plants					
<b>C2.3</b> Species-led weed control programmes					
<b>C2.4</b> Yellow Crazy Ant management					
<b>C2.5</b> Control of feral pigeons					
<b>C2.6</b> Crown-of-thorns on-going control (mainly in Vava'u)					
<b>C3.1</b> Toloa Rainforest restoration Project					
<b>C3.2</b> Pilot a community-led eco-experience					
<b>C3.3</b> 'Eua National Park restoration project					
<b>C3.4</b> Incorporate coastal ecosystems into restoration planning					
<b>C3.5</b> Mt Talau National Park restoration					
<b>C3.6</b> New site restoration programmes					



Tongan tapa cloth. Source: Geographic.Media

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## 12. ANNEXES

### 12.1. ANNEX 1. Priority invasive species for management in Tonga

#### PLANTS

Singapore Daisy/Wedelia <i>Sphagneticola trilobata</i>	Strong coloniser of open areas and well-lit forests. Breeding sites for rats.
Honolulu Rose <i>Clerodendrum chinense</i>	A major weed in many Pacific countries. Grows along roadsides and cultivated as an ornamental. Forms dense stands that exclude other plants.
Fireworks Tree <i>Clerodendrum quadriloculare</i>	Highly invasive shrub that grows along roadsides and disturbed areas and is cultivated as an ornamental. Can form a dense understory, excluding all other plants in forests.
Pagoda Flower <i>Clerodendrum paniculatum</i>	Popular ornamental that often becomes invasive. Like other invasive <i>Clerodendrum</i> , it spreads easily by root suckers and forms dense stands.
African Tulip Tree <i>Spathodea companionata</i>	Crowd out native species and are extremely difficult to remove as they can grow back from fragments and wind-dispersed seeds.
Panama Rubber Tree <i>Castilla elastica</i>	Regarded as an environmental weed, notably in the Pacific. Potential target for the PRISMSS War on Weeds (WOW) management depending on distribution. Surveys to be completed under GEF 6 RIP.
Giant Reed/Wild Cane <i>Arundo donax</i>	Outcompetes native species and can fuel unintended fires.
Koster's Curse <i>Clidemia hirta</i>	Competes with native plants in gaps in undisturbed forests and has the potential to alter forest regeneration. Can be spread by feral pigs.
Lantana <i>Lantana camara</i>	Crowds out grazing lands, native forests, and agricultural areas. Lantana is toxic to most grazing livestock.
Wild tamarind <i>Leucaena leucocephala</i>	Aggressive coloniser of secondary or disturbed vegetation, crowding out other species.
<i>Decalobanthus peltatus</i>	Formerly <i>Merremia peltata</i> . Strong colonising vine in agriculture land, disturbed areas, and coastal forest.
Mikania <i>Mikania micrantha</i>	<i>Mikania</i> is an extremely fast-growing vine that smothers other plants, outcompeting them for sunlight and other resources.
Money Plant <i>Epipremnum pinnatum</i> cv. 'Aureum' ( <i>Scindapsus</i> )	The potential impact is greater than widely recognised, and physical removal is very difficult. Potential target for NENS biocontrol.
Spanish elm <i>Cordia alliodora</i>	Fast-growing coloniser of disturbed areas that outcompetes other species. Potential target for NENS biocontrol.
Arrowleaf Sida <i>Sida rhombifolia</i>	Potential target for NENS biocontrol.
Java Bean <i>Senna tora</i>	A major pasture weed in Vanuatu and in coconut plantations in Fiji. Potential target for NENS biocontrol.
Ivy gourd <i>Coccinia grandis</i>	An aggressive weed that outcompetes natural vegetation and grassland. Reduces biodiversity and damages natural resources. Potential target for NENS biocontrol.
<i>Tecoma stans</i>	Potential target for NENS biocontrol.
<i>Dioscorea bulbifera</i>	Potential target for NENS biocontrol.
<i>Elephantopus mollis</i>	Potential target for NENS biocontrol.
<i>Commelina benghalensis</i>	Potential target for NENS biocontrol.
<i>Piper auritum</i>	Potential target for NENS biocontrol.
Kudzu <i>Pueraria montana</i>	A climbing vine that quickly overgrows other vegetation.

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## MAMMALS

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Black Rat/Ship Rat <i>Rattus rattus</i>	Invasive, tree-climbing rat. Heavy predation by rats can cause extinction of populations of native animals. Damages coconut crops.
Brown Rat/Norway Rat <i>Rattus norvegicus</i>	Invasive rat in coastal areas and around waterways.
Feral Dog <i>Canis lupus familiaris</i>	Potential threat to turtles and scrubfowl.
Feral Goat <i>Capra hircus</i>	Severely damages and destroys plants that provide habitat for other animals. Destroys crops.
Feral House Cat <i>Felis catus</i>	Preys on birds and lizards.
Feral Pig <i>Sus scrofa</i>	Severely damages and destroys plants that provide habitat for other animals. Destroys seabird nests on the ground. Also damages coastal and riparian zones and waterways through disturbance of sediments, sediment pollution, and water fouling.
House Mouse <i>Mus musculus</i>	Potential threat to native insects and other invertebrates.
Pacific Rat <i>Rattus exulans</i>	Preys on native animals. Damages coconut fruit.

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## BIRDS

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Common Myna <i>Acridotheres tristis</i>	Competes with hole-nesting birds and other animals.
Jungle Myna <i>Acridotheres fuscus</i>	<i>Acridotheres tristis</i> is reported but unconfirmed.
Red-vented Bulbul <i>Pycnonotus cafer</i>	Competes aggressively with native birds.

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## INSECTS AND OTHER INVERTEBRATES

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African Big-headed Ant <i>Pheidole megacephala</i>	Has caused or contributed to extinctions of native species elsewhere (including the Pacific). Often does not cause problems but in large numbers can kill native invertebrates, birds, and reptiles.
Dengue Mosquito <i>Aedes aegypti</i>	Carrier of human diseases including dengue and is the most common carrier of Chikungunya fever.
Sweet Potato Whitefly <i>Bemisia tabaci</i>	Causes damage to a wide variety of crops.
Yellow Crazy Ant <i>Anoplolepis gracilipes</i>	Has caused or contributed to extinctions of native species elsewhere. Often does not cause problems (and none currently in Tonga), but outbreaks can kill native species, damage crops, and harm people.

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## MICRO-ORGANISMS

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Banana Bunchy Top Virus	The most serious virus disease of bananas and plantains, transmitted by the banana aphid <i>Pentalonia nigronervosa</i> .
Taro Leaf Blight <i>Phytophthora colocasiae</i>	Can lead to 30-40% crop loss in heavily infected taro fields.

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## MARINE SPECIES

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Crown-of-thorns Starfish <i>Acanthaster planci</i>	Native species that can experience population outbreaks that can damage coral reef functioning. Outbreaks often caused by nutrient addition (waste).
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## 12.2. ANNEX 2. Priority invasive species for prevention from Tonga

### PLANTS

All invasive plants	See species list for key species for prevention in the Pacific region.
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### MAMMALS

Indian Grey Mongoose <i>Herpestes indica</i>	Present in Fiji and Hawai'i with recent incursions in several other Pacific countries.
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Asian Black Rat <i>Rattus tanzenumi</i>	From Eastern Asia. Several incursions have occurred on Pacific islands via fishing boats and wrecks.
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### BIRDS

Eurasian Tree Sparrow <i>Passer montanus</i>	Currently invading several western Pacific countries via Asian shipping vessels. Potential harm not yet known, although a vector for several diseases. Currently damaging crops in the Marshall Islands.
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Common Myna <i>Acridotheres tristis</i>	Widespread invasive in Pacific, including trading partners islands. <i>Acridotheres tristis</i> is reported but unconfirmed.
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Other Passerine Birds, such as Sparrows and Finches	Several species established on Pacific islands, including Eurasian Tree Sparrow (established in Guam and Pohnpei), Java Sparrow (established in Guam, Fiji, and Hawai'i), House Sparrow (established in Fiji and Hawai'i) and House Finch (established in Hawai'i).
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### INSECTS/INVERTEBRATES

Little Fire Ant <i>Wasmannia auropunctata</i>	Established on Guam and Hawai'i as well as elsewhere in the Pacific. Harms biodiversity and impacts agricultural activities. Tramp ants in general are a concern.
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Red Imported Fire Ant <i>Solenopsis invicta</i>	Established in several Pacific rim countries, such as Australia (Brisbane), China, Japan, Republic of Korea, and USA, and occasionally intercepted in New Zealand. Causes devastating socio-economic and environmental damage.
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Coconut Rhinoceros Beetle <i>Oryctes rhinoceros</i>	Established throughout much of the Pacific. Has a new damaging genetic form (CRB-G biotype) that is spreading throughout the Pacific.
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Wasps	<i>Vespula</i> spp. wasps found in Hawai'i and Kiribati. Paper wasps ( <i>Polistes</i> spp.) found in Cook Islands, Easter Island, Hawai'i, Marquesas Islands, and Samoa.
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Taro Beetle <i>Papuana</i> spp.	Established in several countries in the Pacific, including Kiribati.
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Giant African Snail <i>Achatina fulica</i>	Environmental impacts through herbivory on plants and competition with native snails. Vector of a parasitic nematode that can cause meningitis, a sometimes-fatal infection of the brain, in people.
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### REPTILES/AMPHIBIANS

Brown Treesnake <i>Boiga irregularis</i>	Established on Guam where it has caused extensive damage, impacting biodiversity, economy, and human health. Other reptiles are also undesirable.
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Cane Toad <i>Rhinella marina</i> and other frogs	Various frogs are established in both Guam and Hawai'i and Cane Toads are established in Fiji, Tuvalu, and most of the FSM including Kosrae and Palau.
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### MARINE SPECIES

All marine species	Priorities to be determined from the Marine Biosecurity Toolkit (2022)
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## 12.3. ANNEX 3. Priority sites

<b>ʻEua National Park (ʻEua Island)</b>	ʻEua National Park covers 450 hectares and is home to important plant species. Goats and pigs are targets for eradication. ʻEua is a KBA.
<b>Late (Vavaʻu group)</b>	Late (1,731 hectares) is home to endemic and endangered bird species and is a KBA. Late and Late Marine are classified as IBAs. Rat eradication is planned for Late.
<b>Mt Talau (Vavaʻu group)</b>	Important ecosystem of over 20 hectares, with many native bird and lizard species. Weeds and invasive mammals are being managed by the community.
<b>Twin Sisters Islands (Vavaʻu group)</b>	Marine and terrestrial environments have important biodiversity values. These small islands are an IBA for Hengehenga and a turtle breeding site. Several invasive species require management.
<b>Haʻapai group</b>	Rats are to be eradicated on a total of four Haʻapai Islands for the recovery of threatened species. Kao, which lies 6 km north of Late, is an IBA. Hunga Tonga-Hunga Haʻapai is an IBA and KBA.
<b>Tofua and Kao Island (Haʻapai group)</b>	Tofua is a 600-hectare island with rare species of orchids on the CITES list. Require eradication and exclusion of invasive species. Tofua is an IBA, and both islands are KBAs.
<b>Mt Toloa Rainforest project</b>	An ecosystem restoration project with high community involvement targeting invasive weeds and mammals.
<b>Tongatapu group</b>	ʻAta Island and ʻAta Island Marine are IBAs and a Global KBA.
<b>Niufoʻou Island</b>	Tonga's northernmost island is an IBA and KBA.
<b>Vavaʻu group</b>	Vavaʻu Marine is an IBA and KBA. Nearby are the Fonualei and Fonualei Marine IBAs and KBA. Maninita, Taula, and Lualoli compose the Maninita (Out Motu Lalo) IBA.

## 12.4. ANNEX 4. Consultations for NISSAP review

Consultations were held in Tongatapu on 19 August 2021 together with a review of the previous NISSAP. Due to the COVID-19 pandemic, the consultants and SPREP representatives participated remotely using Zoom and Mentimeter technology (SPREP 2021).

The workshop first outlined the process of developing and revising the NISSAP (for the benefit of those who had not attended the consultations for the previous NISSAP), then described the priorities identified for management and prevention and sought feedback and contributions.

Participants were generally concerned for the security of their biodiversity, particularly those species and habitats important for food and livelihood. There was a very high desire to manage existing invasive species and prevent others from arriving.

Specific comments from participants included:

- Educating people on the significance of native plants that are near or already threatened so that we can conserve them effectively. Awareness and capacity building programs run by the Environment Department are needed. More outreach programs needed to strengthen invasive species knowledge.
- Concern about medicinal plants, native birds, and marine resources abundant in the past but now rare. We need to conserve the Tongan whistler and to plan how to manage them sustainably. Formulate plans and activities to protect microbats, which are declining. We need management strategies for coconut crabs like special management areas (SMAs) administered by the Ministry of Fisheries. But crabs' excess consumption of coconut will affect copra production. Conservation of plants is important. Native plants found only in particular places [are important,] such as the fetoumaka plant used for garlands in 'Eua and the hehea plant used for traditional garlands. Children eat the fruit. Replant the motelolo tree as they are rare to find these days.
- To conserve near threatened species and we need more action plans to address invasive species and their impacts. Some species are beneficial in some areas but not invasive in other areas.
- Need to strengthen biosecurity especially with the Department of Quarantine when receiving shipments from China. Empower those working in our borders. There is also a need to build the capacity of staff working in invasive species management. Best way is to avoid [invasive species] getting here. The need for EDRR is imperative.
- Removing invasive plants is also essential and needs to be done immediately.
- Feral pigs need to be managed. We need to draw attention to the economic consequences [that] wild pigs cause in the local communities in 'Eua (the smallest island in Tonga).
- To include management strategies in the establishment of SMAs.
- We need to consider species that also rely on invasive species. Some native species are also pests in other contexts. An example is the lafo plant that is invasive, but its fruit is used for traditional dance costumes.
- The kotia plant (*Cordia alliodora*) has been in Tonga for long now but discovered lately to be invasive. It out-competes other native plants in forests.

- Formulate laws and legal tools to strongly enforce measures regarding invasive management. Strengthen our trading protocols so that partner countries know we are firm with our trading rules.
- Rats are a serious concern because they are sometimes the cause of plantations getting damaged. Insect (pests) affecting crops should also be considered in invasive species management programs. Little Fire Ants, rats, birds, bed bugs, and millipedes were raised as concerns.
- We have no knowledge of marine invasive species. A list of marine invasives should be developed and shared with stakeholders and community leaders so that they are aware and help with decisions regarding managing marine invasives.

## PARTICIPANTS AT TONGATAPU NISSAP WORKSHOP

### FACILITATORS

Viliani Hakaumotu	DOE
Ray Pierce	Eco Oceania
Monica Gruber	Wellington UniVentures
Bradley Myer	SPREP
Isabell Rasch	SPREP

PARTICIPANT	ORGANISATION	POSITION	GENDER	YOUTH?
Tracy 'Aisea	Ministry of Fisheries	Senior Fisheries Officer	F	N
Mele Fa'anunu	Ministry of Fisheries	Fisheries Officer	F	N
Saimone Manu	Department of Information and Research	Head of Entomology Section, MAFF Research	M	N
'Emeline 'Ahoafi	Department of Information and Research	Agriculture Officer	F	N
Hemaloto Tupou	Department of Marine and Ports	Senior Marine Environment officer	M	N
Kaveinga Havea	Tupou College	Business Assistant	M	N
Karen Stone	Vava'u Environment Protection Assn	Director	M	N
Loisi Tongia	Department of Environment	Intern	F	N
Sulieti Hufanga 'Ofa	Department of Environment	Waste Officer	F	N
Siosina Katoa	Department of Environment	PHD student/EIA Officer	F	N
Mele Tovi	Department of Environment	Project Officer	F	N
Paula Finau	Department of Information	ID Officer	F	N
Talivaha Latu'ila	Department of Environment	Information Officer	M	N
Siosiu Latu	Department of Environment	Inform Consultant	M	N
Lupe Matoto	Department of Environment	Director	F	N
'Olivet Lutu	Department of Forestry	Forestry Officer	F	N
Vivien Sika	Department of Environment	Information Officer	M	N
'Alifeleti 'Atiola	Tupou College	Principal	F	N

## 12.4.1. EDRR consultations

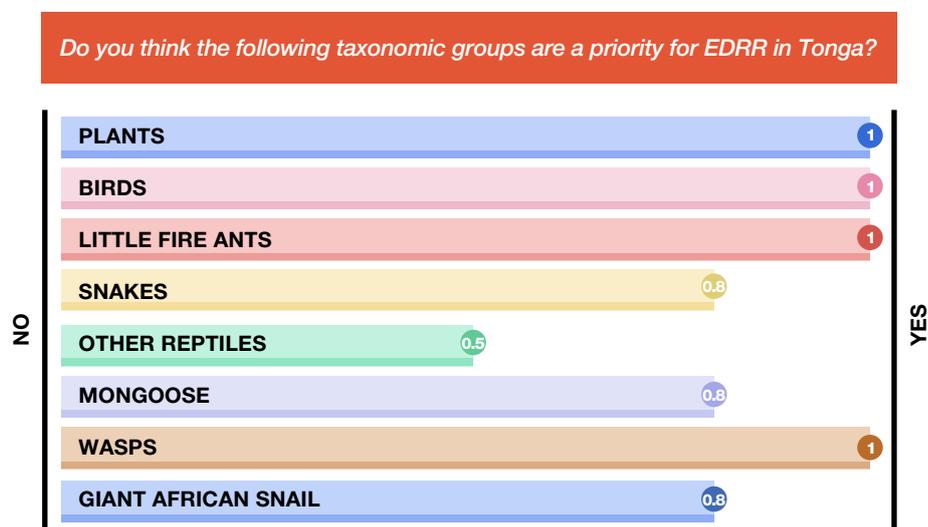
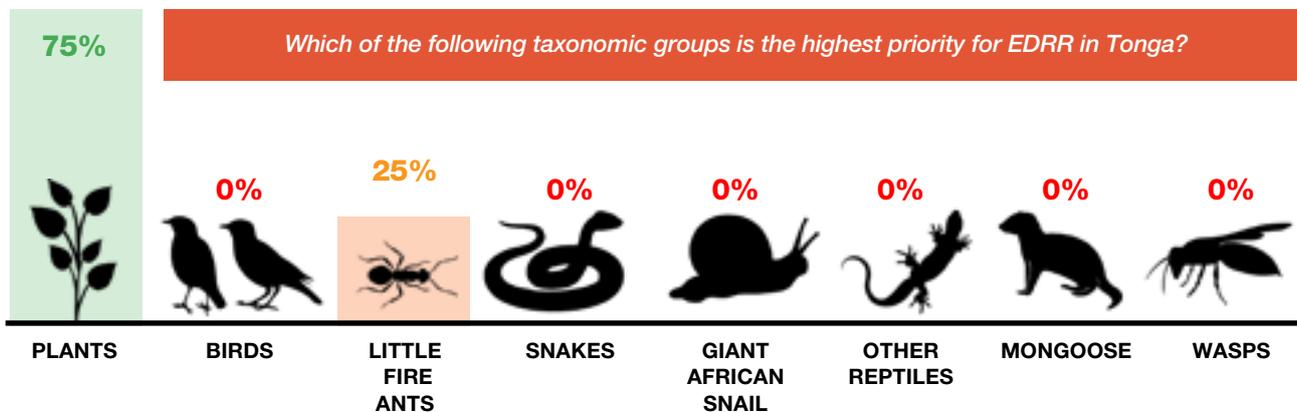
Consultations were held on 8 March 2021 with a focus group to determine priorities for prevention. A list of eight invasive species groups was presented to the focus group, which they were asked to rank in priority order. The focus group was also asked to suggest other species. It was requested that Red Imported Fire Ants be added to the priority groups.

A letter outlining EDRR priorities from the MEIDECC Chief Executive Officer was sent to the responsible authorities for endorsement and was subsequently endorsed by the Ministry of Infrastructure, Ministry of Agriculture, Forestry and Fisheries and Tupou College.

### EDRR FOCUS GROUP PARTICIPANTS

NAME OF PARTICIPANT	ORGANISATION	GENDER	YOUTH?
Siutoni Tupou	MAFF Quarantine	F	N
Viliami Hakaumotu	MEIDECC Department of Environment	M	N
Meliame Kakala	Marine & Port Department	F	N
Mele Tovi	MEIDECC Department of Environment	F	N

### FOCUS GROUP EDRR PRIORITIES, INDICATIVE (based on a survey conducted using Mentimeter)



## 12.5. ANNEX 5. Regional and international organisations and databases related to invasive species management

### 12.5.1. Organisations

#### THE PACIFIC COMMUNITY (SPC)

SPC helps Pacific Island people respond effectively to the challenges they face and make informed decisions about their future and the future they wish to leave for the generations that follow. Go to the website for a description of the core business of each of SPC's Divisions and more detailed information about how they can help. SPC is a leading partner in the PRISMSS Protect our Islands programme.

#### SECRETARIAT OF THE PACIFIC REGIONAL ENVIRONMENT PROGRAMME (SPREP)

SPREP works for its member countries towards the ongoing goal of improved sustainable management of island and ocean ecosystems and biodiversity, in support of communities, livelihoods, and national sustainable development objectives, through an improved understanding of ecosystem-based management and implementation of National Biodiversity Strategy and Action Plans.

The SPREP Island and Ocean Ecosystem Services Strategy is delivered through four main priorities: 1) Biodiversity; 2) Invasive Species; 3) Coastal and Marine; 4) Threatened species. SPREP is a leading partner in the PRISMSS programmes War on weeds and Resilient ecosystems – resilient communities.

#### PACIFIC REGIONAL INVASIVE SPECIES SUPPORT SERVICE (PRISMSS)

Made up of five programmes, PRISMSS is a coordinating mechanism to facilitate the scaling up of operational management of invasive species in the Pacific. PRISMSS brings together experts to provide support within the Pacific region with a focus on protection of indigenous biodiversity and ecosystem function. The goal is to reduce the ecological and socio-economic impact of invasive species on ecosystems through the management or eradication of prioritised species and the protection of valued sites.

PRISMSS currently provides technical support across five programmes for the Pacific region:

1. Protect our islands – “Prevent the Arrival, Establishment and Spread of Invasive Species”
2. Predator free Pacific – “Removing Introduced Mammalian Predators from Islands”
3. War on weeds – “Management of High Priority Weeds”
4. Natural enemies – natural solutions – “Biological Control of Widespread Weeds”
5. Resilient ecosystems – resilient communities – “Priority Area Ecological Restoration”

## 12.5.2. Databases and information resources

### BATTLER RESOURCE BASE

The Battler Resource Base (BRB) is an online portal for resources to assist Pacific island peoples in their battle against invasive species.

The ultimate goal of the BRB is to provide a one-stop-base for invasive species stakeholders' information needs. It is a searchable knowledge resource to support invasive species management.









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