TUVALU
National Invasive Species Strategy and Action Plan
2022–2027

SPREP PROE
Sustainable, transformative and resilient for a Blue Pacific

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Sustainable, transformative and resilient for a Blue Pacific

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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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This plan was based on the National Invasive Species Strategy and Action Plan template developed by the Secretariat of the Pacific Regional Environment Programme (SPREP) Pacific Regional Invasive Species Management Support Service (PRISMSS). The Tuvalu NISSAP was drafted by Sam Panapa, Tuvalu National Invasive Species Coordinator, and Monica Gruber, Pacific Biosecurity, assisted by Ray Pierce of Eco-Oceania, SPREP Invasives Team, Tuvalu Technical Advisory Group members, and PRISMSS partners.

The development of the National Invasive Species Strategy Action Plan for Tuvalu is an activity under the GEF 6 Regional Invasives Project (GEF 6 RIP) – Strengthening national and regional capacities to reduce the impact of Invasive Alien Species on globally significant biodiversity in the Pacific. The GEF 6 RIP is funded by the Global Environment Facility, implemented by the United Nations Environment Programme and executed by the Secretariat of the Pacific Regional Environment Programme.

Photo: D. McFadzien

FOREWORD

We are pleased to present the first National Invasive Species Strategy and Action Plan (NISSAP) for Tuvalu. Invasive species are one of the most significant threats to ecosystems, human and animal health, infrastructure, economy, and cultural resources. Globalisation has led to an increase in the number and type of species being moved around the world. Changes in land use and climate contribute to some habitats becoming more vulnerable to the establishment of invasive species and may increase the opportunities for, and impacts of, biological invasions.

Previous efforts to prevent, eradicate, and control invasive species in Tuvalu demonstrate that collaboration across all levels of government, Kaupule, landowners, and other interested parties is critical to minimising the spread and impact of invasive species. This NISSAP will provide us with guidance on how to address the problems that invasive species pose to our environment. The NISSAP is a plan for an urgent and effective response to reduce the threat of invasive species. It will help us enact preventive measures for early detection and rapid response at our marine ports and airports, specifically targeting inbound commercial shipments and the importation of exotic animals and plants.

Although the challenge is substantial, it is not impossible. We can act now—conclusively and strategically—to prevent and minimise the spread and impacts of invasive species on our ecosystems, health, economies, and infrastructure.

Our charge is to join together and act.

Hon Ampelosa Tehulu
Minister
Ministry of Public Works, Infrastructure, Environment, Labour, Meteorological and Disaster

Hon Sa'aga Teafa
Minister
Ministry of Local Government and Agriculture

KEY CONCEPTS

Biocontrol or biological control	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.
Biodiversity	The variety of living organisms on Earth, including the variability within and between species and within and between ecosystems.
Biosecurity	Preventing the spread of invasive species across international or internal borders.
Containment	Keeping an invasive or pest species within a defined area.
Control	Reducing the population of an invasive species (numbers and distribution).
Ecosystem	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.
Ecosystem services	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.
Effective management	Achieving operational success (such as reducing the pest to defined levels) and desired outcomes (such as reduced impact and recovery of impacted values) of invasive species management.
Emergency response	The differences between the terms emergency response, incursion response and EDRR might not be obvious:
Emergency response	▪ 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.
Incursion response	▪ Incursion response is an emergency response where the event is the arrival of a harmful pest or invasive species.
Early Detection and Rapid Response (EDRR)	▪ 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.
Emergency response plan	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.
Endemic species	A native species that naturally occurs confined to a single specific country or area. Indigenous (native) species occur naturally in one or more places.
Environmental Impact Assessment	Evaluates the impact of development and other activities on the environment and puts in place actions to mitigate these environmental impacts.
Environmental and social impact assessment	In addition to assessing environmental impact, an ESIA evaluates potential impacts to people and puts in place mitigation actions.
Eradication	The removal of every individual of an invasive species from a specific place. Eradication is only successful if every individual is removed.

Introduced species	Plants, animals, and other organisms taken beyond their natural range by people, deliberately or unintentionally.
Invasive species	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.
Kaupule	Established on each island of Tuvalu, the function of the council is to support and guide the work of the islands and enforce conservation legislations and by-laws.
Monitoring	Programmes to detect change, such as change in the distribution of invasive species, the success of management projects, and so on.
Movement control	Placing restrictions on the movement of people, animals, plants, and goods to restrict the spread of an invasive species. See also containment.
Native species	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.
Neonative species	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.
Non-native species	Non-native species are those species that have been introduced by people. Non-native species include both harmful (that is, invasive) and beneficial species.
Pacific Regional Invasive Species Support Service	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), and War on Weeds (WOW).
Pathway	The means by which an invasive species can be transported.
Pest	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.
Precautionary principle	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.
Region	When not otherwise qualified, means the Pacific Ocean, with specific reference to the island states and territories members of SPC and SPREP.
Risk assessment	Evaluation of the risk that a new introduced species will become invasive with damaging consequences; this evaluation is conducted prior to its introduction.
Surveillance	Monitoring to detect the arrival of new invasive species.
Threatened species	General term for species ranked by IUCN as Critically Endangered (CR), Endangered (EN), or Vulnerable (VU).

ACRONYMS

CABI	Commonwealth Agricultural Bureaux International
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DOA	Department of Agriculture
DOE	Department of Environment
DOMPS	Department of Marine and Port Services
DOF	Department of Fisheries
DOC	Department of Customs
DOPH	Department of Public Health
EDRR	Early Detection and Rapid Response
EIA	Environmental Impact Assessment
ERP	Emergency Response Plan
ESIA	Environmental and Social Impact Assessment
GBIF	Global Biodiversity Information Facility
GEF	The Global Environment Facility
GEF 6 RIP	Global Environment Facility Regional Invasives Project: Strengthening national and regional capacities to reduce the impact of Invasive Alien Species on globally significant biodiversity in the Pacific. See: https://www.thegef.org/projects-operations/projects/9410
GISD	Global Invasive Species Database (maintained by ISSG)
GISIN	Global Invasive Species Information Network
HPWRA	Hawai'i-Pacific Ecosystems at Risk
IAS	Invasive Alien Species
IASP	Invasive Alien Species Project – the team responsible for Tuvalu's GEF 6 RIP activities
IBA	Important Bird Area of BirdLife International, recognising key sites for bird conservation
IBPoW	Island Biodiversity Programme of Work
IS	Invasive Species
ISSG	Invasive Species Specialist Group of the Species Survival Commission of the IUCN
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area, a key area for biodiversity survival, part of a global partnership

MISCCAP	Managing Invasive Species for Climate Change Adaptation in the Pacific
NBSAP	National Biodiversity Strategy and Action Plan
NEA	National Executing Agency of the GEF 6 RIP
NENS	Natural Enemies–Natural Solutions
NISSAP	National Invasive Species Strategy and Action Plan
PBIF	Pacific Biodiversity Information Framework
PestList (PLD)	Pacific islands PestList Database
PFP	Predator Free Pacific
PIAT	Pacific Invasive Ant Toolkit
PIER	Pacific Island Ecosystems at Risk – for plant risk assessment information
PIF	Pacific Islands Forum
PILN	Pacific Invasives Learning Network
PIP	Pacific Invasives Partnership
PIRT	Pacific Islands Roundtable for Nature Conservation
Plant Pono	Hawai'i-Pacific Ecosystems at Risk website for plant risk assessment information
PMBT	Pacific Marine Biosecurity Toolkit
POI	Protect our Islands
PoWPA	Programme of Work on Protected Areas
PRISMSS	Pacific Regional Invasive Species Support Service
RERC	Resilient Ecosystems, Resilient Communities
SOPs	Standard Operating Procedures
SPC	(Secretariat of the) Pacific Community
SPREP	Secretariat of the Pacific Regional Environmental Programme
SSC	Species Survival Commission of IUCN
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNCCD	United Nations Convention to Combat Desertification
WOW	War on Weeds

SPECIES REFERRED TO IN THE DOCUMENT

Species are present in Tuvalu unless otherwise indicated. Presence was initially derived from a subset of the ISSG list for Tuvalu (ISSG 2019) and reviewed during the NISSAP creation.

ENGLISH NAME	COMMON NAME TUVALU	SCIENTIFIC NAME	STATUS
MICRO-ORGANISMS			
Grey Leaf Spot		*Pestalotiopsis palmarum/ Pyricularia grisea*	invasive
Taro Leaf Blight		*Phytophthora colocasiae*	invasive (absent)
Brown Leaf Spot, Coconut leaf spot		*Pseudoepicoccum cocos/ Bipolaris incurvata*	invasive[1]
Breadfruit Soft Rot		*Phytophthora palmivora*	invasive
PLANTS			
Coral Vine	Mouku	*Antigonon leptopus*	invasive (absent)
Mexican Poppy		*Argemone mexicana*	invasive (absent)
Giant Reed	Mouku	*Arundo donax*	invasive (absent)
Spanish Needle	Mouku	*Bidens alba*	invasive
Spanish Needle	Mouku	*Bidens pilosa*	invasive (absent)
Beach Dodder	Fetai	*Cassytha filiformis*	native
Ironwood	Pulukamu	*Casuarina equisetifolia*	invasive
Burrgrass	Mouku talatala	*Cenchrus echinatus*	invasive
Honolulu Rose	Inato	*Clerodendrum chinense*	invasive[2]
Beach privet	Inato	*Clerodendrum inerme*	invasive
Fireworks Tree		*Clerodendrum quadriloculare*	invasive (absent)
Koster's Curse		*Clidemia hirta*	invasive (absent)
Coconut	Niu	*Cocos nucifera*	introduced
Taro	Taro	*Colocasia esculenta*	native
Dayflower	Mouku solo	*Commelina diffusa*	invasive[3]
Bermuda Grass	Mouku	*Cynodon dactylon*	invasive
Four Finger Grass	Mouku matikao fa	*Dactyloctenium aegyptium*	invasive
Merremia		*Decalobanthus peltatus*[4]	invasive (absent)
Crabgrass	Mouku	*Digitaria ciliaris*	invasive
Wiregrass	Mouku uaea	*Eleusine indica*	invasive
Money Plant/Devil's Ivy	Tuuteu	*Epipremnum pinnatum* cv. 'Aureum' (*Scindapsus*)	invasive
Lovegrass	Mouku	*Eragrostis tenella*	invasive
Tall Fringe Rush	Mouku milimili taliga	*Fimbristylis dichotoma*	introduced

[1] Noted as present by consultation participants, and listed in PestNet as present, but not in the ISSG list

[2] Not noted as present on the ISSG list

[3] Not noted as present in the ISSG *list*

[4] *Formerly* Merremia peltata

ENGLISH NAME	COMMON NAME TUVALU	SCIENTIFIC NAME	STATUS
Wild Moon Flower	Fue kena	*Ipomoea macrantha*	invasive[5]
Beach Morning Glory	Fue piniki	*Ipomoea pes-caprae*	native
Lantana	Kaipuaka	*Lantana camara*	invasive
Wild Tamarind	Tamalini	*Leucaena leucocephala*	invasive
Hawaiian Wood Rose	Mouku	*Merremia tuberosa*	invasive (absent)
Mile-a-minute Weed	Saketa Lauliki	*Mikania micrantha*	invasive
Giant Sensitive Plant	Mouku moemoe	*Mimosa diplotricha*[6]	invasive (absent)
Sensitive Plant	Mouku matiotio	*Mimosa pudica*	invasive
Noni	Nonu	*Morinda citrifolia*	native
Screwpine	Fala	*Pandanus tectorius*	native
T-grass	Mouku	*Paspalum conjugatum*	invasive
Saltgrass	Mouku kona	*Paspalum vaginatum*	invasive
Stinking passionflower	Mouku	*Passiflora foetida*	invasive (absent)
Indian Pluchea	Mili	*Pluchea indica*	invasive
Kudzu		*Pueraria montana*	invasive (absent)
Bunchy Sedge	Mouku	*Pycreus polystachyos*	native
Coffee Senna	Mouku	*Senna occidentalis*	introduced
Yellow Pea Bush	Mouku	*Sesbania cannabina*	invasive
Turkeyberry		*Solanum torvum*	invasive (absent)
African Tulip Tree		*Spathodea campanulata*	invasive (absent)
Singapore Daisy/Wedelia	Metilia	*Sphagneticola trilobata*	invasive
Rat-tail Dropseed	Felo te kimoa	*Sporobolus fertilis*	invasive[7]
Beach Pea	Saketa	*Vigna marina*	native
ANTS			
Yellow Crazy Ant	Loo sega makinikini	*Anoplolepis gracilipes*	invasive
	Loo	*Brachymyrmex* sp.	introduced
		Monomorium ebeninum,	introduced
Nylanderia sp.	Loo	*Nylanderia bourbonica, N. vaga*	introduced
Black Crazy Ant	Loo uli makinikini	*Paratrechina longicornis*	invasive
Trap-jaw Ant	Loata	*Odontomachus simillimus*	native
	Loo	*Pheidole fervens*	introduced
African Big-headed Ant	Loo	*Pheidole megacephala*	invasive
Tropical Fire Ant	Loo kula	*Solenopsis geminata*	invasive
Red Imported Fire Ant	Loo kula	*Solenopsis invicta*	invasive (absent)
Ghost Ant	Loo	*Tapinoma melanocephalum*	invasive
Fijian White-footed Ant	Loo	*Technomyrmex vitiensis*	invasive (absent)

[5] Not noted as present on the ISSG list

[6] Naming confusion over time has resulted in the name *Mimosa invisa* being used incorrectly in the past for *Mimosa diplotricha*.

[7] Not noted as present on the ISSG list

ENGLISH NAME	COMMON NAME TUVALU	SCIENTIFIC NAME	STATUS
Bicoloured Pennant Ant	Loo	*Tetramorium bicarinatum*	invasive
		Tetramorium caldarium	introduced
Similar Groove-headed Ant	Loo	*Tetramorium simillimum*	invasive
Singapore Ant	Loo kula	*Trichomyrmex destructor*[8]	invasive
Little Fire Ant	Loo	*Wasmannia auropunctata*	invasive (absent)
OTHER INSECTS/INVERTEBRATES			
Giant African Snail	Misa Afelika	*Achatina fulica*	invasive (absent)
Yellow-fever Mosquito	Namu	*Aedes aegypti, A. albopictus* and *A. polynesiensis*	invasive[9]
Melon Aphid	Afiti	*Aphis gossypii*	invasive[10]
Coconut Scale	Te unafi sega	*Aspidiotus destructor*	invasive
Fruit flies	Lago o fuaga lakau	*Bactrocera passiflorae, B. xanthodes*	invasive
Sweet Potato Whitefly		*Bemisia tabaci*	invasive (absent)
Coconut Crab	Uu	*Birgus latro*	native
Cockroach	Mogamoga	*Blattodea* spp.	introduced
Crab	Kaipea	*Cardisoma rotundum*	native
	Tupa	*Cardisoma carniflex*	native
Armored Scale	Te unafi uli	*Chrysomphalus dictyospermi*	invasive[11]
Circular Scale	Te unafi kula	*Chrysomphalus aonidum*	invasive (absent)
Brown Soft Scale	Te unafi kaaki	*Coccus hesperidum*	invasive[12]
Hermit crab	Uga	*Coenobita* spp.	native
Southern House Mosquito	Namu	*Culex quinquefasciatus*	invasive
Kou Leaf worm	Anufe o kanava	*Ethmia nigroapicella*	invasive
Tessellated Scale	Te unafi papaa	*Eucalymnatus tessellatus*	invasive[13]
Red Millipede		*Eurymerodesmus* sp.	introduced
Striped Mealybug	Milipaki selesele	*Ferrisia virgata*	invasive[14]
Mottled Crab	Kamakama	*Grapsus albolineatus*	native
Black Mirid Garden Fleahopper	Te filii uli	*Halticus bractatus, H. minutus*	invasive[15]
Pink Mealybug	Milipaki piniki	*Maconellicoccus hirsutus*	invasive
Land Snail	Misa	*Melampus* spp.	native
House Fly	Lago	*Musca domestica*	introduced

[8] Formerly *Monomorium de*structor

[9] The ISSG list only notes *A. aegypti* as present

[10] Not noted as present on the ISSG list

[11] Not noted as present on the ISSG list

[12] Not noted as present on the ISSG list

[13] Not noted as present on the ISSG list

[14] Not noted as present on the ISSG list

[15] Noted as present by consultation participants, but not on the ISSG list

ENGLISH NAME	COMMON NAME TUVALU	SCIENTIFIC NAME	STATUS
Coconut Termite	Temaiti	*Neotermes rainbowi*	invasive[16]
Coconut Rhinoceros Beetle		*Oryctes rhinoceros*	invasive (absent)[17]
Ghost Crab	Kaviki	*Ocypode cerophthalmaa*	native
Hibiscus Snow Scale	Te unafi kena	*Pinnaspis strachani*	invasive[18]
Snail	Misa	*Sinployea pseudovicaria*	native
Snail	Misa	*Sinployea ellicensis*	native
Taro Leafhopper	Kinauele	*Tarophagus proserpina*	invasive[19]
Red Spider Mite	Maiti	*Tetranychus urticae*	invasive[20]
Snail	Misa	*Thaumatodon decemplicata*	native
Cabbage Looper	Anufe	*Trichoplusia ni*	invasive
Taro Beetle		*Papuana* sp.	invasive (absent)
Snail	Misa	*Vatusila vaitupuensis*	native
Wasps	Lago fufu	*Vespula* spp. and *Polistes* spp.	invasive (absent)[21]
MARINE SPECIES			
Crown-of-thorns Starfish/ Sea Star	Kamu	*Acanthaster planci*	native
Alga (Seaweed)		*Caulerpa taxifolia*	native
Humphead Wrasse/Giant Wrasse		*Cheilinus undulatus*	native
Mozambique Tilapia	Tilapia	*Oreochromis mossambicus*	invasive
Alga (Seaweed)	Liimu	*Sargassum polycystum*	native
Marine snail		*Trochus niloticus*	invasive
REPTILES/AMPHIBIANS			
Brown Tree Snake	Gata	*Boiga irregularis*	invasive (absent)
Green Turtle	Fonu	*Chelonia mydas*	native
Olive Small-scaled Skink		*Emoia lawesi*	native
Hawksbill Turtle	Fonu	*Eretmochelys imbricata*	native
Oceanic gecko	Moko	*Gehyra oceanica*	invasive[22]
Asian House Gecko	Pili kena	*Hemidactylus frenatus*	invasive (absent)[23]
Plague Skink/Rainbow Skink		*Lampropholis delicata*	invasive (absent)
Mourning gecko	Moko lefulefu	*Lepidodactylus lugubris*	invasive[24]
Tuvalu Forest Gecko	Tepukapili	*Lepidodactylus tepukapili*	Tuvalu endemic
Cane Toad	Lane	*Rhinella marina*	invasive

[16] Not noted as present on the ISSG list

[17] Noted as present in the ISSG list

[18] Not noted as present on the ISSG list

[19] Not recorded as present in the ISSG list

[20] Not noted as present on the ISSG list

[21] Mentioned as an invasive species of concern *in* Tuvalu during Funafuti consultation

[22] Not noted as present on the ISSG list

[23] May be present

[24] Not noted as present on the ISSG list

ENGLISH NAME	COMMON NAME TUVALU	SCIENTIFIC NAME	STATUS
MAMMALS			
Feral Cattle	Pulumakau	*Bos taurus*	invasive (absent)
Feral Dog	Kuli	*Canis lupus familiaris*	invasive
Feral Goat	Kooti	*Capra hircus*	invasive [25]
Feral House Cat	Puusi	*Felis catus*	invasive
Indian Grey Mongoose		*Herpestes javanicus*	invasive (absent)
House Mouse	Kimoa foliki	*Mus musculus*	invasive
Pacific Rat	Kimoa polinisia	*Rattus exulans*	invasive
Brown Rat/ Norway Rat	Kimoa kaaki	*Rattus norvegicus*	invasive
Black Rat/Ship Rat	Kimoa uli	*Rattus rattus*	invasive
Asian Rat	Kimoa Asia	*Rattus tanezumi*	invasive (absent)
Feral Pig	Puaka	*Sus scrofa*	invasive
Flying fox		*Pteropus* spp. unspecified	endangered elsewhere (absent)
BIRDS			
Jungle Myna	Manu	*Acridotheres fuscus*	introduced (eradicated)
Common Myna		*Acridotheres tristis*	invasive (absent)
Mallard duck	Taki	*Anas platyrhynchos*	introduced
Pacific black duck	Toloa	*Anas superciliosa*	native
Brown Noddy	Gogo	*Anous stolidus*	native
Black or White-capped Noddy	Lakia/Taketake	*Anous minutus*	native
Ruddy Turnstone	Kolili	*Arenaria interpres*	migrant
Pacific Pigeon	Lupe	*Ducula pacifica*	native
Great Frigatebird	Katafa	*Fregata minor*	native
Jungle fowl	Moa	*Gallus gallus*	invasive
White Tern	Matapula/Akiaki	*Gygis alba*	native
Wandering Tattler	Tulitainamu	*Heteroscelus incanus*	migrant
Grey-headed Gull	Talaliki	*Larus cirrocephalus*	native
Lesser Golden Plover	Tuli	*Pluvialis dominica*	migrant
Phoenix Petrel		*Pterodroma alba*	native
Red-vented Bulbul		*Pycnonotus cafer*	invasive (absent)
Brown Booby	Kanapu	*Sula leucogaster*	native
Long-tailed Cuckoo	Kaleva	*Urodynamis taitensis*	migrant

[25] Only one goat remains in Tuvalu, so functionally extinct from the country

1 INTRODUCTION

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, or medicines), regulating (such as providing 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 Tuvalu

Tuvalu is a small island state in the Polynesian subregion of the Pacific Ocean. Tuvalu is made up of nine low-lying island groups (Nanumea, Nanumaga, Niutao, Nui, Vaitupu, Nukufetau, Funafuti, Nukulaelae, and Niulakita) and has a total land area of only 26 square kilometres but an Exclusive Economic Zone of 900,000 square kilometres.

Over many years, Tuvaluans have developed an intimate knowledge of plants and marine resources that are of specific and general use. Plants are a food source and have many other uses including in house construction, household and kitchenware products, medicine, canoe construction, firewood, compost, fishing gear, cash crops, handicrafts, and dancing costumes. Tuvaluans also have a deep knowledge of marine species, their habitats, and their life cycles, such as where and when to fish and what baits to use.

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

FIGURE 1: Map of Tuvalu (© GEOATLAS™, worldometers.info)

1.1.1 History and population

A creation story of the islands of Tuvalu is te Pusi mo te Ali (the Eel and the Flounder). Te Ali (the Flounder) is the origin of the flat atolls of Tuvalu, while te Pusi (the Eel) represents the coconut tree that is important in the lives of Tuvaluans.

Tuvalu was settled by Polynesian peoples, and there was frequent canoe voyaging between the islands. Eight of the nine island groups were inhabited, which is the source of the name Tuvalu: “eight standing together”. During the Polynesian migrations, Tuvalu may have been a stepping-stone from Samoa into the Polynesian outlier communities in Melanesia and Micronesia. The oral histories of the different islands include stories of Tongan, i-Kiribati, and Samoan interactions.

While European explorers, slavers, traders, whalers, and scientists visited various islands between the 1600s and 1800s, European colonisation was formally imposed from around the 1890s, when Tuvalu was named the Ellice Islands. Tuvalu played an important role in World War II as a staging base for American troops and was subject to air attacks. The former American airfield is now the airport at Funafuti.

After World War II, the country was part of the Gilbert and Ellice Islands Territory, with Tarawa the capital. A referendum in 1977 mandated the separation of the two island groups, and Tuvalu achieved independence on 1 October 1978. Strong links continue to be maintained with Kiribati. The traditional assemblies, Falekaupule, were established in 1997 as the local government on each island.

The population was estimated at 11,370 in 2017, growing at a rate of 0.82% per year (excluding the expatriate communities mainly in Australia, New Zealand, and Kiribati). More than 50% of the population resides on Funafuti, which has a land area of about 1.9 square kilometres, forming a population density of 3,283 people per square kilometre—higher than populous places such as Bangladesh. Funafuti has the nation's only airport and main port facilities, acting as the transport hub for the other islands.

1.1.2 Environment

Tuvaluans have developed an intimate knowledge of plants and marine resources and their use.

The local communities are very aware of terrestrial and marine species of importance and have a perception of the state and condition those species are in. In a 2009 survey of four island groups (Tilling and Fihaki 2009), the Funafuti community identified 220 important marine species, 113 plant species, 22 birds, and 46 other terrestrial species, as well as the perceived abundance and vulnerability of these species. The Nanumea community identified several trees that have immense value to them, including Falakai (*Pandanus tectorius*), Nonu (*Morinda citrifolia*), Olesi/Pawpaw (*Carica papaya*), Mei/Breadfruit (*Artocarpus* spp.), and Fetau/Alexandrian Laurel (*Calophyllum inophyllum*). Niutao community members identified many marine and terrestrial species that were plentiful and some they considered to be endangered. No information was provided in the report for Nanumaga.

Like other tropical Pacific island nations, Tuvalu experiences a relatively hot and humid climate with seasonal rains, cyclones, and thunderstorms between November and April. Because of its location near the Pacific equatorial dry zone, droughts are common and more severe in the northern than the southern islands, commonly from August to October.

Tuvalu's plant diversity is relatively low, with around 300 species recorded, of which around 65 are native (Thaman et al. 2017). Indigenous plants are rare partly because of habitat modifications such as extensive coconut plantings and other food plants. Similarly, animal diversity is also relatively low, consisting primarily of birds, with 28 indigenous species, 20 of which are seabirds and a few of which are migratory. Insects, land crabs, and a few species of lizards are also common, with one possible endemic, Tepukapili/Tuvalu Forest Gecko (*Lepidodactylus tepukapili*; Thaman et al. 2017).

The marine environment of Tuvalu is diverse and composed of six major ecosystem types (oceanic, outer reef, lagoonal, back reef, lagoon floor, and the patch reefs and natural channels between the ocean and lagoon), with extensive communities of corals, other invertebrates, algae, plankton, fish, and marine mammals and reptiles. Approximately 350 species of fish have been recorded (Tilling and Fihaki 2009).

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

1.1.3 Economy

Most Tuvaluans practice subsistence fishing, farming, and the harvest of plant products, depending on fish, shellfish and other sea foods, coconut, breadfruit, bananas, taro, pandanus, a limited number of other crops, pigs, chickens, seabirds, and some wild plants, such as the bird's nest fern (laukatafa). Plants and a limited range of marine organisms are also the main traditional sources of medicines, fuel, construction and boatbuilding materials, handicrafts, garlands, and perfumes (Thaman et al. 2012). The marine environment provides the main local source of protein, and Tuvaluans know a great deal about marine species, habitats, and life cycles, such as where and when to fish and what baits to use. Fishing is carried out by men, but women may also, from time to time, be involved in inshore and shallow water fishing.

Tuvalu soil is sandy or coral gravel so does not support a strong agricultural economy. Subsistence farming and fishing are the primary economic activities. Primary exports are fish and related products mainly exported to Thailand, Japan, and Australia. Tuvalu is heavily reliant on food imports.

Tuvalu's Gross Domestic Product (GDP) increased from USD 18.2 million in 2003 to USD 47.2 million in 2019, with per capita GDP rising in that time from USD 2,628 to USD 4,470. Commercial fishing operations have increased on Funafuti in recent years, and there are now about 30 commercial fishermen on Funafuti Island using more modern methods and gear. As a result of Tuvalu's large EEZ, fishing licensing agreements with Taiwan, Japan, South Korea, New Zealand, and the United States generate a significant income, accounting for more than 45% of GDP. Another large income source is the employment of around 15% of the adult male population overseas in the maritime industry, along with remittances from Tuvaluans working overseas, official development aid, and income from the Tuvalu Trust Fund.

Funafuti has the nation's only airport and port facilities and acts as the transport hub for the other islands.

1.2 The significant threat of invasive species for Tuvalu

Invasive species cause harm across a wide range of human activities in 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, with an associated 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.
- **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 undermining 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. Tuvalu 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 Tuvalu but are 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). Tuvalu already has at least 10 of the species on this list (three mammals, one amphibian, two ants, and four plants), but there are many more out there ready to invade if Tuvalu does not maintain strong border control.

Tuvalu NBSAP (2012–2016) interviews with interested parties noted that new discoveries of the medicinal value of invasive plants such as the Saketa Lauliki/Mile-a-Minute (*Mikania micrantha)*[26] make it difficult for locals to support complete eradication of such species. Plants such as Saketa Lauliki are also used for composting for soil improvement.

[26] This was listed in the NBSAP with the scientific name *Persicaria perfoliata*, which is most likely incorrect and a result of confusing two plants that have the same English name. Only *Mikania micrantha* is present in the Pacific islands region.

1.2.1 Threats already within Tuvalu

A desktop survey has reported 131 records of introduced species in Tuvalu (ISSG 2019). Although not all these species will cause harm (that is be invasive), some carry a high risk. The current range of animal and plant pests found in Tuvalu threatens the survival of some native species.

MAMMALS AND BIRDS

Rodents (three species of rats Kimoa [*Rattus* spp.] and mice *[Mus musculus*]) and Puusi/feral cats (*Felis catus*) may threaten the survival of native reptiles (such as *Tepukapili*) and native birds that are traditional food sources, such as Gogo/Brown Noddy (*Anous stolidus*), Lakia/ Taketake/Black Noddy (*Anous tenuirostris*), Lupe/Pacific Pigeon (*Ducula pacifica*), and Kanapu/ Brown Booby (*Sula leucogaster*). Rodents and cats can also damage forest growth and harm 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 Kuli/feral dogs (*Canis lupus familiaris*) are found in Tuvalu and can all cause harm to the environment and to people if they are out of control.

AMPHIBIANS

The Lane/Cane Toad (*Rhinella marina = Bufo marinus*) produces a poison that is lethal to many animals. The toads were introduced as a biocontrol in many places including Fiji, Australia, Solomon Islands, and Tuvalu. However, they compete with native reptiles and prey on native insects.

ANTS AND OTHER INSECTS AND INVERTEBRATES

Tuvalu has 18 ant species, none of which are locally endemic (Gruber et al. 2017). Four are Indo-Pacific (regional) natives, six are introduced but not considered harmful, and eight species are considered invasive in the Pacific. The invasive species include Yellow Crazy Ant (*Anoplolepis gracilipes*), Black Crazy Ant (*Paratrechina longicornis*), African Big-headed Ant (*Pheidole megacephala*), Ghost Ant (*Tapinoma melanocephalum*), Tropical Fire Ant (*Solenopsis geminata*), Bicoloured Pennant Ant (*Tetramorium bicarinatum*), Similar Groove-headed Ant (*Tetramorium simillimum*), and Singapore Ant (*Trichomyrmex destructor* formerly *Monomorium destructor*).

Other introduced insects of concern include Southern House Mosquito (*Culex quinquefasciatus* – a known carrier of Avian influenza), three *Aedes* species including Yellow-fever Mosquito (*Aedes aegypti*), as well as a fruit fly (*Bactrocera* sp.). Other crop pests are also present, including Coconut Scale (*Aspidiotus destructor*), Kou Leaf worm (*Ethmia nigroapicella*), Pink Hibiscus Mealybug (*Maconellicoccus hirsutus*) and Black Mirid Garden Fleahopper (*Halticus minutus*). The Kou Leaf worm caterpillar only attacks *Cordia*. The pest has spread rapidly and defoliated many trees along the lagoon coast of all the islands except Niulakita and Nukulaelae.

PLANTS

Pest plants, or weeds, threaten native plants and forest quality and impact on the agricultural sector, requiring the extensive use of expensive herbicides to control them, which may also have non-target effects. Of the 303 introduced plant species recorded in Tuvalu, 79 are weeds.

Pacific islands Ecosystems at Risk (PIER) has assessments for 44 of the plant species in Tuvalu, and the majority have scores that indicate they are high risk (26) or species to be 'rejected', that is extreme risk and should not be imported (11). Of these, the highest risk species are Lantana camara, T Grass (*Paspalum conjugatum*), Singapore daisy/Wedelia (*Sphagneticola trilobata*), Mile-a-minute Weed (*Mikania micrantha*), Spanish Needle (*Bidens alba*), Spreading Dayflower (*Commelina diffusa*), Tamalini (*Leucaena leucocephala*), Mouku matiotio (*Mimosa pudica*), Coffee Senna (*Senna occidentalis*), Yellow Pea Bush (*Sesbania cannabina*), and Bermuda Grass (*Cynodon dactylon*).

Other plants noted as problematic include Beach Morning Glory (*Ipomea pes-caprae*) and Dodder Laurel/Love-Vine (*Cassytha filiformis*). However, these are species native to the Pacific region and can also have positive benefits, such as preventing erosion.

MARINE INVASIVES

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

1.2.2 Impacts of invasive species in Tuvalu

The Rapid Biodiversity Assessment (Biorap; Thaman et al. 2017) noted that invasive species are considered an increasing issue in the country. Concerns included:

1. agricultural pests and diseases
2. invasive plants, such as *Sphagneticola trilobata*
3. devastation of the kanava (*Cordia subcordata*) trees by an invasive moth caterpillar, the Kou leaf worm (*Ethmia nigroapicella*)
4. rats that threaten birds and other indigenous species and transmit human disease
5. infestations of invasive ants that threaten both land crabs and seabird hatchlings
6. the spread of an invasive brown seaweed in Funafuti Lagoon.

People are also aware of other invasive species such as Lane/Cane Toad.

Yellow Crazy Ants have been problematic in Tuvalu, mostly because of population explosions. Yellow Crazy Ants threaten a wide range of species, including birds, reptiles, and invertebrates such as Uu and Tupa. The Yellow Crazy Ant is considered a problem in Tuvalu and is well known for its impact on Christmas Island (Australia), where it has changed the entire forest community (O'Dowd et al. 2003). This ant species has been implicated in extinctions of native species. In Tokelau, it caused declines in Uu and reduced the reproductive success of Akiaki/White Tern (*Gygis alba*) (Gruber et al. 2018).

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

1.2.3 Potential threats to Tuvalu

From a biosecurity perspective, Tuvalu is fortunate that it has relatively few direct external pathways—the key transport linkage being with Fiji. However, Fiji is a transit point for freight and passengers from much further afield, so indirect risks are present (see Section 5 on pathways for details).

Fiji has several invasive species that could cause significant harm in Tuvalu, including myna birds, mongoose, and the Green Iguana lizard (*Iguana iguana*). The desktop review (ISSG 2019) identified 301 plants, 170 invertebrates (including insects), 110 fungi, 28 vertebrates, 26 viruses, and 15 bacteria that occur in Fiji and could be unintentionally introduced to Tuvalu.

Giant African Snail (*Achatina fulica*) is incorrectly recorded from Tuvalu but is frequently intercepted in Fiji. As well as ecological 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.

Although a lower risk, species from further afield may also arrive through boats in transit at other ports, such as fishing vessels. There are many examples from other island countries of invasive species that have had devastating and very costly consequences. The Brown Tree Snake (*Boiga irregularis*) is thought to have caused the extinction of 10 native landbird species in Guam leaving only two (Rodda and Savidge 2007). Many other snakes occur in Pacific rim countries.

Taro Leaf Blight (Phytophthora colocasiae) reduced annual export returns for this crop in Samoa from around WST 10 million to around WST 150,000 (USD 60,000) over a couple of years (Hunter et al. 1998). The arrival of such a disease in Tuvalu could wipe out Tuvalu's taro crop.

If Red Imported Fire Ants arrive, they are predicted to potentially cost Tuvalu USD 676,059 per year in crop, livestock, health, and infrastructure impacts and could harm 15 already threatened species (Gruber et al. 2021).

The Indian Grey Mongoose (Herpestes javanicus) is of particular concern, with at least four recent incursions documented in the Pacific.

Other potential introductions that are of concern to agriculture in Tuvalu include the Coconut Rhinoceros Beetle (*Oryctes rhinoceros*) and Taro Beetle *(Papuana* spp.). While these species are not threats to biodiversity, their potential impacts on agriculture and food security can be severe.

During consultations, Flying Fox (species name not noted) was mentioned as an undesirable pest. All flying foxes are native to islands in the Pacific and are either endangered or critically endangered.

Wasps (*Vespula* spp. and *Polistes* spp.) are frequent passengers on ships, already present in Kiribati and Hawai'i in the Pacific, and if they arrived would harm biodiversity and people's health.

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).

Even if an invasive species is already present, there are varieties and strains with different levels of impact. For example, large Black Rats that have recently invaded Rennell Island in the Solomon Islands from Southeast Asia have a devastating impact on crops, including taro, coconut, and papaya (S. Cranwell, R. Pierce pers. obs.). The Coconut Rhinoceros Beetle (*Oryctes rhinoceros*) has many different strains, and one type has devastated coconut crops in Guam and is now found in the Pacific in Papua New Guinea, Hawai'i, Palau, Solomon Islands, and Rota.

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

1.2.4 Changes in impacts due to climate change

Climate change has been described as an existential problem for some Pacific island countries and territories (Connell 2016, Pasisi 2019). The direct environmental impacts of climate change include warmer average temperatures (including freshwater, ocean, and lagoon habitats), 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 secondary consequences that are difficult to predict.

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, including:

- 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; and
- indigenous species are typically ill equipped to adapt to a changing climate. Invasive species may benefit from change.

For example, Tuvalu currently has several species of mosquito, including the introduced *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 could 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.

Workshop on Climate Change.

1.3 Invasive species – everyone's responsibility

The movements of people, and their goods and supplies, are the key pathways by which 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 and around 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 Tuvalu or move around the country, they must follow biosecurity requirements set by Department of Agriculture (DOA), Biosecurity Division.

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 the DOA Biosecurity Division 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 Tuvalu 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 Tuvalu's biodiversity by acting as an 'early warning system' for new invasive species observed within Tuvalu. iNaturalist can be used freely by anyone with access to a smartphone or computer.

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.

Tuvalu's NBSAP (2012–2016) reported that some invasive species in Tuvalu are perceived by members of the community as positive and did not record any species that people considered harmful. The NBSAP noted that greater awareness of the impacts of invasive species generally in Tuvalu may have been needed. However, the Biorap (Thaman et al. 2017) found that people were more aware of invasive species than indicated in the older NBSAP (see 1.2.2).

1.4 Biodiversity at risk in Tuvalu

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 Tuvalu NBSAP (2012–2016) does not single out any priority species for conservation but highlights the general practices of conservation including limits on harvesting of Coconut Crab and preservation of traditional Pulaka/Swamp Taro (*Colocasia esculenta) pits.*

Until recently, no detailed biodiversity surveys were carried out in Tuvalu, so the knowledge of the abundance and condition of species was based on anecdotal evidence (Tilling and Fihaki 2009). The Biorap in 2017 comprehensively assessed Tuvalu's terrestrial and marine biodiversity, listing many species that had declined or are perceived by Tuvaluans as threatened.

IUCN records several threatened terrestrial species in Tuvalu, including globally threatened and critically endangered Beck's Petrel (*Pseudobulweria becki*), which is preyed upon by rats and feral cats and pigs.

Ten marine species have been assessed as endangered, including: Blue Whale *Balaenoptera musculus*, four sea cucumbers (*Holothuria nobilis, Holothuria scabra, Holothuria whitmaei*, and *Thelenota ananas*), two Mako sharks (*Isurus oxyrinchus* and *Isurus paucus*), the Whale Shark (*Rhincodon typus*), the Green Sea Turtle (*Chelonia mydas*), and the Humphead Wrasse (*Cheilinus undulatus*). While sharks and whales may not be susceptible to invasive species, marine invasives could change habitat that is used by sea cucumbers. Sea turtles are vulnerable to a wide range of invasive species including rats and ants.

Terrestrial endangered species include the Micronesian Skink (*Emoia adspersa*) and two seabirds Polynesian Storm-petrel (*Nesofregetta fuliginosa*, which may be a visitor rather than breeding in Tuvalu) and Phoenix Petrel (*Pterodroma alba*).

Mammalian predators including rats, feral cats, feral dogs, and pigs cause habitat degradation, and Yellow Crazy Ants potentially cause Phoenix Petrel to abandon their nests. Yellow Crazy Ants have also caused declines in populations of the Micronesian Skink.

Tepukapili gecko is the only endemic species in Tuvalu, but this species is not listed in the IUCN Red List for Tuvalu. Also not on the Tuvalu Red List is the vulnerable Bristle-thighed Curlew (Numenius tahitiensis), which is recorded as wintering in Tuvalu (Watling 1998).

Several non-threatened species are considered important for socio-economic reasons. Gogo, Lakia/Taketake, Lupe, and Kanapu are the four most important birds harvested for food. Three crabs are important and common traditional food: Kaipea (*Cardisoma rotundum*), Tupa (*Cardismoa carnifex*), and Uu. Tuvaluans use Misa snails (several species including *Melampus* spp., *Sinployea pseudovicaria, Sinployea ellicensis, Vatusila vaitupuensis,* and *Thaumatodon decemplicata*) to make garlands, an important source of income for some women.

1.5 Why is a NISSAP needed?

There are many reasons to develop a NISSAP, but the five key 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 island nations, and with increasing trade and movement of people between countries, the threat of new species arriving is increasing. 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 their impacts on native biodiversity and the 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 been fragmented and uncoordinated in the past. The NISSAP seeks to address this problem by bringing all interested parties 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 interested parties 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.

Agriculture Staff

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. To date, more than 60 Pacific islands have had predators removed.

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 in 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 for 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 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 Decision-making; and Management Action.

This document is Tuvalu's first 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 development of the NISSAP began with a review of existing information conducted by the Invasive Species Specialist Group (ISSG 2019) and other information sources. A draft NISSAP was developed by the National Invasive Species Co-ordinator. Extensive consultations were held with interested parties (see Annex 4). Approximately 15 people were consulted with in Funafuti and Vaitupu from mid-February to the first week of April in 2020. A follow-up half-day consultation was held with the staff of the Department of Agriculture. The resulting initial draft NISSAP was sent to the Technical Advisory Group (TAG) for review. In 2021, the draft NISSAP was updated to reflect the regional standards and its Action Plan was reviewed at a national workshop with the TAG. The draft NISSAP was reviewed by communities, government representatives, and other interested parties in nationwide consultations held between July and October 2023.

Environment Staff

2 LINKAGES OF THE NISSAP TO OTHER STRATEGIES

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 are 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 have a greater likelihood 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.

Te Kakeega II

Te Kakeega II is Tuvalu's National Strategy for Sustainable Development 2005–2015. The goal of Te Kakeega II is to implement the vision of the Malefatuga Declaration: "By 2015, guided by strong spiritual values enshrined in its motto—Tuvalu mo te Atua (Tuvalu for God; God for Tuvalu)—we will have achieved a healthy, educated peaceful and prosperous Tuvalu."

National Biodiversity Strategy and Action Plan 2012–2016

Invasive species are a key theme in the NBSAP, which identified two invasive species actions that have been incorporated in this NISSAP:

1. establish management plans to control and eradicate invasive species
2. upgrade capacity, equipment, and infrastructure to enforce biosecurity at all points of entry including inter island transportation.

2.2 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 goals and targets under the Convention on Biological Diversity 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 (2022) being revised.

3 GUIDING PRINCIPLES

The Convention on Biological Diversity (CBD) identified a full list of 15 principles as an annex to the report of the sixth Conference of the Parties (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.

Environment Day.

4 GOAL, THEMES, AND OUTCOMES

4.1 Goal

To facilitate and guide the protection of the biodiversity and livelihoods of Tuvalu 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 several invasive species present in Tuvalu 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 necessary restoration work is undertaken on sites where invasive species have been removed.

4.3 Outcomes

Outcomes are derived from the regional *Guidelines for invasive species management in the Pacific*.

THEME A: Three outcomes are identified to ensure that the impacts of invasive species are understood and actions to manage them are 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, to establish systems for risk management and prioritisation, and to 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.

Photo: D. McFadzien

5 PATHWAY IDENTIFICATION

ISSG has compiled a review (ISSG 2019) that identifies the ways that different invasive species can move to or around Tuvalu. 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

A major link by both air and sea is through Fiji. Because Fiji is a gateway for freight coming from many other locations, there are indirect risks that are present at the ports in Fiji.

5.1.1 By air

Funafuti is the only international airport in Tuvalu. It receives Fiji Airway flights from Suva three times a week (Tuesdays, Thursdays, and Saturdays) and Air Kiribati once a week (Wednesdays).

5.1.2 By sea

Funafuti is the only international port of entry in Tuvalu. The port receives cargo ships (mainly from Fiji but also Australia and New Zealand) and fishing vessels. Cargo can arrive on container ships and barges.

Many fishing vessels visit the area from Korea, China, Taiwan, American Samoa, and Fiji. In some cases, these vessels visit other ports such as the Marshalls, Kiribati, Vanuatu, and Solomon Islands, and they can also have close contact with mother ships. There is limited contact between these ships and shore; however, crew often go ashore. Some invasive species such as plant seeds may be inadvertently transported by crew, while others, such as birds and insects, can fly from the ships to shore, and rats can swim ashore.

Asian fishing vessels have been known to carry snakes and rats, and biosecurity at the home ports is often inadequate.

BALLAST WATER

Ballast water is a major concern as the main pathway for introduction of invasive species in many aquatic and marine ecosystems.

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 Tuvalu, but the major threat is an indirect one through consequent relief operations. 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 Tuvalu without the aid of human transportation. Although natural flight, being carried by the wind, swimming, and rafting on floating objects/vegetation can move species to any new place, there are no records of unassisted arrivals in Tuvalu. Despite a lack of records, there is a need for people to be watchful for any unusual species or any new signs of damage to plants or harm to animals.

5.2 Internal pathways

5.2.1 By sea

Domestic travel between the islands is only via local ships, with voyages among all the islands occurring twice a month. Quarantine facilities operate in Vaitupu and Nanumaga for Coconut scale and in Niulakita for fruit fly.

The local passenger and cargo vessel, based at Funafuti, occasionally calls at Suva, Fiji.

Natural pathways can also transport species around Tuvalu.

Port of Entry

6 ROLES AND RESPONSIBILITIES IN INVASIVE SPECIES MANAGEMENT

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

6.1 Local community

KAUPULE

Kaupule (local governments on each island) are key partners of the Departments of Agriculture and Environment when it comes to the management of invasive species on the islands. Kaupule on each island can enforce conservation legislation that can protect the environment and native species.

There are six members in each Kaupule, and each member of each Kaupule has a portfolio. A member that responsible for Agriculture will work together with the department's Agricultural Assistants to undertake biosecurity and other agricultural work.

All members of the community have an important role to play in minimising the impacts of invasive species, including detecting and reporting new incursions. Eradication and management also need community support.

6.2 National

Many agencies have roles and responsibilities in Tuvalu invasive species management.

DEPARTMENT OF AGRICULTURE (DOA) BIOSECURITY DIVISION

The Biosecurity Division, within the Department of Agriculture, plays the lead role in preventing and managing invasive species and pests. Under the Biosecurity Act (2017), the Biosecurity Division is mandated to prevent invasive species introductions to Tuvalu and their spread around the islands. It is also mandated to manage pests that are already present in Tuvalu, particularly agricultural pests such as scale insect, fruit flies, and ant incursions.

DEPARTMENT OF ENVIRONMENT (DOE)

The DOE is the lead agency for protecting Tuvalu's environment. It is mandated under the Environment Protection Act (2008) to manage invasive species within Tuvalu.

DEPARTMENT OF MARINE AND PORT SERVICES (DOMPS)

This department is mandated to lead any measures that prevent ballast water discharge into the sea and to enhance hull-antifouling procedures on ships.

DEPARTMENT OF FISHERIES (DOF)

The Department of Fisheries is responsible for the management, development, and conservation of all fisheries resources in accordance with the Fisheries Ordinance (1978).

Currently, the Department of Fisheries does not have a mandate for the management of marine invasive species in Tuvalu. Staff have the diving and marine survey skills necessary, but those skills have not been used to undertake work on marine invasive species. However, the Department of Fisheries has provided support to communities to manage Crown-of-thorns Starfish. There is a need for staff training in the identification of other invasive species.

DEPARTMENT OF CUSTOMS (DOC)

The Customs Unit is responsible for the security of Tuvalu's borders. Customs Officers have the power to conduct checks on any goods, luggage, and travellers to ensure that no illegal goods are imported, including smuggled species.

DEPARTMENT OF PUBLIC HEALTH (DOPH)

The Department of Public Health's main role is the health of people. The DOPH monitors the health status of incoming passengers to prevent the arrival of new diseases. It can order and recommend involuntary examination, treatment, isolation, and quarantine to individuals or groups of people.

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 impacts 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)
Protect our islands	Prevent the arrival, establishment, and spread of invasive species	Pacific Biosecurity (Wellington UniVentures) and SPC
Predator free Pacific	Removing introduced mammalian predators from islands	Island Conservation and Birdlife International
War on weeds	Management of high priority weeds	SPREP
Natural enemies – natural solutions	Biological control of widespread weeds	Manaaki Whenua – Landcare Research
Resilient ecosystems – resilient communities	Priority area ecological restoration	SPREP

7 PAST AND CURRENT PROGRAMMES

EMERGENCY RESPONSE PLAN DEVELOPMENT

The Department of Agriculture and SPC developed a General Emergency Response Plan for Plant Pest Incursions. The plan outlines at a high level the steps to be taken when there is an outbreak caused by plant pests:

- **detection and identification** (Information from detection site, identification, preliminary information on the pest, initial response decisions)
- **delimiting survey** (Survey, response decisions to be made, notification)
- **containment** (Preparation, implementation, monthly review)
- **surveillance** (Preparation, implementation, monthly review)
- **eradication** (Preparation, implementation, monthly review)
- **stand down** (Report, notification, disbandment of response team).

ONGOING BIOLOGICAL CONTROL OF PEST INSECTS

A biological control programme exists for Coconut Scale and Taro Leafhopper. SPC provides the control agents and the Department of Agriculture assists with releases. The biocontrol insects include *Chilocorus nigritus* for Coconut Scale in Nanumaga and Vaitupu Islands and *Cytorrhinus fulvus* for Taro Leafhopper on Funafuti and Vaitupu Islands. The Department of Agriculture also provides advice on how to treat pests and planting of pest-resistant trees.

The Lane/Cane Toad was introduced to Tuvalu as a biological control agent for mosquitos; now the Cane Toad has become a pest itself and is widely distributed. It typically inhabits second-growth vegetation, forest plantation, agricultural plantations, and pulaka pits. It feeds largely on invertebrates and competes with other species for food.

ONGOING CONTROL OF CROWN-OF-THORNS

The native Crown-of-thorns Starfish and *Sargassum* seaweed are subject to periodic control when significant population increases or ‘outbreaks’ have occurred due to altered environmental conditions. The underlying causes of the outbreaks, rather than the species themselves, will need to be managed.

YELLOW CRAZY ANT MANAGEMENT

A management plan was developed for Yellow Crazy Ant control. Training and treatment with pesticides has been undertaken in Funafuti, Nui, and Nukufetau since 2016. Overall, the treatments have resulted in a significant improvement. This work is funded by the Tuvalu government, after initial capacity-building though the New Zealand Ministry of Foreign Affairs and Trade Partnership in International Development Fund Project 'Building resilience to the threat of invasive ants in the Pacific'. In 2016, the work focussed on Funafuti atoll (Fongafale and Tepuka motu) and Nukulaelae atoll (Fangaua, Motala, and Tumiloto motu). Some parts of Niulakita, Nui, Nukufetau, Nanumaga, and Niutao were also treated, and more control is planned.

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, 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, including 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.

BIOSECURITY TRAINING PROGRAMMES

Tuvalu has been involved in many biosecurity trainings in the last five years including: Yellow Crazy Ant Management (Pacific Biosecurity; Tuvalu 2017), Coconut Pests and Diseases Workshop (SPC; Samoa 2018), Building Plant Biosecurity Capacity in the Pacific Region (ACIAR; Australia 2018), Pacific Regional Pest and Disease Diagnostic Workshop (Pacific Biosecurity and New Zealand Ministry of Primary Industries; New Zealand 2019), Pest Surveillance and Identification (SPC; Tuvalu 2019), Natural Enemies – Natural Solutions online training (Manaaki Whenua; online 2021).

8 LEGISLATION AND INTERNATIONAL CONVENTIONS

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

8.1 National legislation

There are five sources of law in Tuvalu: The Constitution, Acts of Parliament, Customary Law, Applied Law, and the Common Law. There is no formal integrated environmental protection and conservation legislation. Environmental protection provisions are found in a raft of different laws, including:

- Biosecurity Act 2017
- Custom Revenues and Border Protection Act 2014
- Marine Pollution (Amendment) Act 2017
- Environment Protection Act 2008
- Plants Act 2008
- Importation of Animals Act 1964
- Conservation Areas Act 1999
- Wildlife Conservation Act 2008
- Pesticides Act 2008
- Quarantine Act 1929
- Public Health Act 2008
- Falekaupule Act 2008
- Foreshore and Land Reclamation Act 2008
- Fisheries Ordinance 1978.

Central government has devolved many powers to local government (Kaupule). The Falekaupule Act 1997 established councils (Kaupule) on all islands of Tuvalu. The Kaupule is the executive arm of the Falekaupule. Generally, the duty of every Kaupule is to maintain order and good government, promote development within its area, and to carry out functions conferred on it by the Falekaupule Act or any other Act.

8.1.1 Under development

No legislation affecting invasive species is currently under development.

8.2 International conventions and agreements

Tuvalu is party to the several 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 flora, fauna, 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 Kunming-Montreal Global Biodiversity Framework (GBF) has established new targets to 2030 for invasive species that focus strongly on biosecurity (Target 6):

> *"Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent, by 2030, eradicating or controlling invasive alien species especially in priority sites, such as islands."*

NAGOYA PROTOCOL ON ACCESS TO GENETIC RESOURCES AND THE FAIR AND EQUITABLE SHARING OF BENEFITS ARISING FROM THEIR UTILISATION (NAGOYA PROTOCOL)

The Nagoya Protocol to the Convention on Biological Diversity aims to enable sharing of the benefits arising from the use of genetic resources in a fair and equitable way. By helping to ensure benefit-sharing, the Nagoya Protocol creates incentives to conserve and sustainably use genetic resources and therefore enhances the contribution of biodiversity to development and human well-being.

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.

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 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 gas 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 the 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 harmonized 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 came into force in 1995. The agreement applies to the importation of pests, diseases, disease-carrying organisms, or disease-causing organisms and:

- provides a uniform interpretation of the measures governing safety and plant and animal health regulations;
- is applicable to all sanitary and phytosanitary measures, directly or indirectly affecting international trade; and
- defines sanitary and phytosanitary measures 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 International Maritime Organization adopted this Convention endorsed 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)

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

The Action Plan is based on the nine outcomes in the regional guidelines.

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
A1.1 Awareness and outreach programmes are designed and implemented					
A1.1.1 Promote and, as needed, develop targeted communications and outreach initiatives to raise awareness of the urgent need and unique opportunity to protect Tuvalu from the adverse impacts of invasive species (GEF 6 RIP 3.2.3)	Limited awareness/ outreach activity for invasive species	Ongoing awareness programme established by the end of the GEF 6 RIP	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS Communications (for support) NISC/IASP DOE (ongoing) DOA and DOMPS support	GEF 6 RIP then as department funds allow
A1.1.2 Awareness programme developed for target audiences (GEF 6 RIP 3.2.3)	No awareness programmes in place	Outreach plan developed for target audiences based on results of baseline survey mid-2023	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS Communications (development) NISC/IASP DOE (ongoing) DOA and DOMPS support	GEF 6 RIP
A1.1.3 Awareness programme implemented for target audiences (GEF 6 RIP 3.2.3)	No awareness programmes in place	Awareness materials sourced and tailored for Tuvalu's use by end of 2024 Outreach events (depending on how programme is designed)	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS Communications (development) NISC/IASP DOE (ongoing) DOA and DOMPS support	GEF 6 RIP then as department funds allow

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
A1.2 Make invasive species information publicly available					
A1.2.1 Agriculture to provide a list of pests present in Tuvalu and in neighbouring countries such as Fiji and Kiribati	Pest list is available from Tuvalu but not other countries	Get pest lists from other countries by mid-2023 Distribute to extension officers for sharing with communities mid-2023	NISSAP annual reporting	NISC/IASP DOA PRISMSS POI (SPC can provide PestList information)	Department budget
A1.2.2 Agriculture to provide a list of weeds present in Tuvalu and in trading countries such as Fiji and Kiribati	Desktop survey (ISSG) has list of weeds for Tuvalu	Get desktop surveys if available for other countries from SPREP by mid-2023 Distribute to extension officers for sharing with communities mid-2023	NISSAP annual reporting	NISC/IASP DOE PRISMSS (WOW – to provide distribution information)	Department budget
A1.2.3 Fisheries and Marine Departments to provide a list of marine invasive species present in Tuvalu and in neighbouring countries	Uncertain	Get information for marine invasives by mid-2023 (from the Marine Biosecurity Toolkit) Distribute to extension officers for sharing with communities in mid-2023	NISSAP annual reporting	NISC/IASP DOF Marine Biosecurity Toolkit (to provide information)	Department budget
A1.3 Incorporate invasive species into primary and secondary education					
A1.3.1 Develop a plan for incorporating invasive species content into the school curriculum (science syllabus primary and secondary level)	No plan for invasive species learning in the primary or secondary curricula	High-level plan developed by end of 2024	Curriculum Plan NISSAP annual reporting	NISC/IASP DOE DOA Education	Department budgets/staff time or seek funding
A1.3.2 Develop curriculum materials from existing sources and tailor to Tuvalu's needs based on information from other countries, such as Kiribati Year 6 invasive species curriculum (also on the Pacific Invasive Ant Toolkit); SPREP Little Fire Ant resources	No curriculum content	Source curriculum content from partners such as PRISMSS, regional Education departments, other NISCs, PILN, and so on by late 2023	NISSAP annual reporting	NISC/IASP DOE DOA Education Potentially PRISMSS for provision of generic materials that can be adapted to Tuvalu's needs	Departmental budgets/staff time
A1.3.3 Customise content for Tuvalu 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	NISC/IASP DOE DOA Education	Departmental budgets/staff time

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
A2.1 A National Invasive Species Coordinator (NISC) is appointed					
Establishment of the NISC position	NISC (IASP) roles established in 2020 through GEF 6 RIP	Maintain at least one NISC position as funding allows throughout GEF 6 RIP	Position filled NISSAP annual reporting	DOE	GEF 6 RIP until 2024
Ongoing support of the NISC activities as a core position of DOE following completion of GEF 6 RIP	NISC (IASP) roles established in 2019 through GEF 6 RIP	Maintain at least one NISC position as funding allows after GEF 6 RIP	Position filled NISSAP annual reporting	DOE	Need to identify a source for ongoing funding or as department funds allow
A2.2 Ongoing oversight by the Technical Advisory Group (TAG) on invasive species issues					
A2.2.1 Regular TAG meetings to discuss cross-sectoral invasive species issues and enhance cross-sectoral support (GEF 6 RIP Tuvalu 1.1.1)	TAG established in 2020	TAG meetings held every six months and minuted	GEF 6 RIP reporting Minutes of TAG meetings NISSAP annual reporting	NISC/IASP TAG members	GEF 6 RIP until 2024
A2.2.2 Continue support of the national multi-sectoral invasive species Technical Advisory Group (TAG)	TAG established in 2020	TAG meetings held every six months and minuted Maintain this multi-sectorial invasive species team and encourage activities As funding allows	GEF 6 RIP reporting Minutes of TAG meetings NISSAP annual reporting	NISC/IASP TAG members	Need to identify a source for ongoing funding Cost-shared by TAG member departments as funds allow

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
A2.3 Participate in knowledge-sharing through PILN meetings and communications					
A2.3.1 Establish or continue membership of PILN	IASP team became members of PILN from 2020	IASP to attend PILN Meetings and share knowledge from activities in Tuvalu	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP SPREP	GEF 6 RIP to fund PILN meeting attendance
A2.4 Funding is available to carry out the NISSAP activities					
A2.4.1 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)	Tuvalu 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	DOA DOE SPREP Consultants	GEF 6 RIP (for Sustainable Funding guidelines) Other donors
A2.5 National invasive species teams include extension officers					
A2.5.1 Extension officer training needs assessed (GEF 6 RIP 1.1.5)	Extension officers have limited understanding of invasive species issues or management	Needs assessed for nine extension officers by mid-2023	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOA (Principal Extension Officer)	GEF 6 RIP
A2.5.2 Training programme designed for extension officers (GEF 6 RIP 1.1.5)	Depending on A2 1.1	Depending on A2 1.1	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOA (Principal Extension Officer) PRISMSS POI and PFP (information and support)	GEF 6 RIP
A2.5.3 Extension officer training delivered on-island by project staff (GEF 6 RIP 1.1.5)	Depending on A2 1.2	Training delivered by end of GEF 6 RIP in 2023	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOA	GEF 6 RIP then ongoing as part of department budget
A2.6 Quarantine (biosecurity) training to improve national border and inter-island biosecurity					
A2.6.1 Quarantine (biosecurity) training needs assessed (GEF 6 RIP 3.1.1)	Staff in established positions are trained, but new recruits need training	Checklist of training needs developed by end of 2023	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOA PRISMSS POI support	GEF 6 RIP
A2.6.2 Quarantine (biosecurity) training delivered (GEF 6 RIP 3.1.1)	Training is dependent on what is available at the time	Quarantine training is delivered as needed by end of 2023	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOA PRISMSS POI (SPC) support	GEF 6 RIP

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
A2.7 Structured national invasive species/biosecurity annual work programmes implemented					
A2.7.1 Annual work programmes defined, including monitoring and reporting	Structured international and some domestic biosecurity work programmes are in place Invasive species work programmes are in place but are either unstructured, not resourced, or not financed	Structured invasive species work programmes are in place by the end of 2024	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOE DOA PRISMSS support	GEF 6 RIP for defining work programmes
A2.7.2 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/IASP DOE DOA PRISMSS support	Ongoing department budgets and staff time

Photo: Loia Tausi

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
A3.1 Develop a NISSAP for Tuvalu					
A3.1.1 NISSAP written and operational for Tuvalu (GEF 6 RIP Tuvalu 1.1.3)	Tuvalu does not have a NISSAP	NISSAP completed and endorsed 2023	GEF 6 RIP reporting NISSAP annual reporting	Consultants NISC/IASP SPREP	GEF 6 RIP
A3.1.2 Monitor NISSAP progress	Tuvalu does not have a NISSAP	Completion of NISSAP annual reporting	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP (until end of GEF 6 RIP) DOE	GEF 6 RIP DOE after completion of GEF 6 RIP
A3.1.3 Review NISSAP and revise	The present NISSAP (2023)	Mid-term review and initiation of revised NISSAP by 2025	NISSAP annual reporting	DOE	DOE
A3.1.4 Ensure broad participation for next NISSAP to enhance invasive species awareness and understanding throughout Tuvalu	Representatives for most islands contributed to this NISSAP, but visiting the islands has benefits for raising awareness in the communities	Next NISSAP consultations	Next NISSAP	DOE	To be determined Department budgets are not sufficient for consultations or consultants
A3.2 Strengthened regulations and policies in place					
A3.2.1 Domestic Biosecurity protocols developed (see C1.2)	see C1.2	see C1.2	see C1.2	see C1.2	see C1.2
A3.3 Ballast Water Strategy, statute, and regulations					
A3.3.1 Ballast water compliance monitoring	No mechanism to check ballast water discharge	Tuvalu's ballast water requirements to be included in the biosecurity clearance form to ensure compliance Spot checks and declarations on ballast water form by mid-2023 Marine Biosecurity Toolkit used to manage risk from marine species	NISSAP annual reporting	DOMPS	Department budget

9.2 THEME B PROBLEM DEFINITION, PRIORITISATION, AND DECISION-MAKING

9.2.1 B1 Baseline and Monitoring

B1 OUTCOME

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

B2 ACTIONS

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
B1.1 Biodiversity baseline surveys (marine and terrestrial) established and repeated as required					
B1.1.1 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 teams of invasive species and their identification for biodiversity checklists	Extensive Biorap was conducted in 2017 Last biodiversity survey was 2021 (R2R project) but only records four common invasive species	Repeat surveys in first quarter of 2024 and at least every five years thereafter Record results in iNaturalist POI project (new invasive species) and GBIF Obtain species identification tools (including Marine Biosecurity Toolkit) by end of 2023	NISSAP annual reporting	NISC/IASP DOE DOMPS PRISMSS partners (for invasive species identification tools)	Department budgets as funds allow R2R project
B1.1.2 Survey of Funafuti port with SPREP marine advisor	Extensive Biorap was conducted in 2017 Last biodiversity survey was 2021 (R2R project) and only records four common invasive species	Funafuti port survey with SPREP marine advisor depending on travel restrictions	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOE DOMPS	GEF 6
B1.2 Collection and sharing of biodiversity information					
B1.2.1 Promote PBIF as a tool for use by communities and schools to improve collection of occurrence information and identification of invasive species	At 11 October 2021, there were 9,829 records for Tuvalu in GBIF, but only 31 occurrences originated from within Tuvalu	Promote use of the iNaturalist app through networks (schools, government departments, and so on)	NISSAP annual reporting	NISC/IASP	DOE department funding
B1.2.2 Make biodiversity information publicly available via PBIF/GBIF	At 11 October 2021, there were 9,829 records for Tuvalu 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
B2.1 Risk profiles for the most important invasive species threats completed					
B2.1.1 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 11 terrestrial species prioritised (See Annex 2)	EDRR Plan completion for eight threat species by end of 2023 (see C1.3)	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP PRISMSS POI (Pacific Biosecurity) PRISMSS Partners (support) NISC/IASP	GEF 6 RIP
B2.1.2 Marine invasive species risk profiles, particularly focussed on protected areas (GEF 6 RIP 2.1.2)	No profiles for marine invasives (see also B1.1) for surveys	Dependent on completion of the Marine Biosecurity Toolkit (see C1.4)	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP PRISMSS partners (for support)	GEF 6 RIP

9.2.3 B3 Research on priorities

B3 OUTCOME

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

B3 ACTIONS

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
B3.1 Estimate economic impact of invasive species to Tuvalu					
B3.1.1 Use existing research to estimate the economic impact of invasive species and use the results to inform NISSAP iterations	Economic impacts of invasive species in Tuvalu are unknown	Assess potential or actual economic impacts of one invasive species in Tuvalu by end of 2023	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP PRISMSS partners (for support)	GEF 6 RIP
B3.2 Use available research to guide prevention and management of priority species					
B3.2.1 Keep up to date with knowledge through subscribing to email lists (such as PestNet, 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 2023	NISSAP annual reporting	NISC/IASP PRISMSS partners (for support)	Not applicable, 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
C1.1 International biosecurity infrastructure strengthening					
C1.1.1 Investigate feasibility of implementing X-ray scanners for biosecurity at the airport and fumigation facilities or other treatment for outgoing containers in Funafuti Ensure there is a realistic plan for maintenance (X-ray) and consider safety (fumigation)	No X-ray or fumigation facilities for biosecurity	Dependent on funding	NISSAP annual reporting	DOA	Funding to be determined
C1.2 Domestic and International invasive species pathways secured					
C1.2.1 Pathways (across national boundaries and inter-island) identified (GEF 6 RIP 3.1.1)	Pathways have been identified by ISSG Eleven priority international species/taxa have been identified for EDRR (C1.3)	Ongoing assessment of risk species and pathways to identify emerging threats	GEF 6 RIP reporting NISSAP annual reporting	DOA PRISMSS partners (support for risk assessment) DOE	GEF 6 RIP
C1.2.2 Biosecurity gap analysis (GEF 6 RIP 3.2.2)	Biosecurity gaps not fully known (such as domestic pathways not secured generally or for specific species)	Biosecurity gaps identified by June 2024 Timeframe depending on COVID-19 response	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS PFP (Island Conservation) DOA NISC/IASP	GEF 6 RIP
C1.2.3 Depending on gap analysis, develop protocols and implement biosecurity enhancements (GEF 6 RIP 3.1.1)	Depending on gap analysis	Protocols developed by 2024	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP to lead implementation DOA PRISMSS POI (Pacific Biosecurity) PRISMSS Partners (support)	GEF 6 RIP

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
C1.2 Domestic and International invasive species pathways secured					
C1.2.4 Domestic pathway mitigation plan extended (domestic biosecurity protocols) for species not widely distributed, such as cane toads from Vaitupu, Funafuti, and Nanumaga, and invasive plants among islands (GEF 6 RIP 3.1.1)	Currently domestic biosecurity is in place for fruit fly from Niulakita and coconut scale on Nanumaga and Vaitupu	Implement domestic biosecurity for priority invasive species (including cane toads and invasive plants) for all domestic pathways by end of 2024	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOA PRISMSS Partners (support)	GEF 6 RIP
C1.3 EDRR implemented for priority invasive species not yet in Tuvalu					
C1.3.1 EDRR plans and protocols written for at least three priority high risk groups in priority sites (GEF 6 RIP 3.1.2)	Tuvalu has a general ERP for plant pests Surveillance undertaken for fruit fly and quarantine is in place for fruit fly from Niulakita and coconut scale on Nanumaga and Vaitupu	Develop endorsed EDRR plan for three highest priority invasive species by beginning of 2024	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOA PRISMSS POI (Pacific Biosecurity – plan development)	GEF 6 RIP
C1.3.2 EDRR specialist equipment bought (GEF 6 RIP 3.1.2)	Tuvalu does not have specialist equipment for priority species	Specialist equipment delivered to Tuvalu by the end of 2024 or sooner, COVID-19 permitting	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS POI (Pacific Biosecurity)	GEF 6 RIP
C1.3.3 EDRR training completed for the three priority species (GEF 6 RIP 3.1.2)	No training undertaken	Training undertaken by the end of 2024 or sooner, COVID-19 permitting	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOA PRISMSS POI (Pacific Biosecurity)	GEF 6 RIP
C1.3.4 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 C1.3.3	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS POI (Pacific Biosecurity) NISC/IASP DOA	GEF 6 RIP
C1.3.5 Ongoing surveillance for the three priority species, and others if possible (GEF 6 RIP 2.1.2)	Surveillance not currently undertaken for the priority invasive species Surveillance is undertaken for crop pests such as fruit flies, ants, and beetles	Regular surveillance in place by mid-2023	GEF 6 RIP reporting NISSAP annual reporting	DOA	GEF 6 RIP DOA funding after GEF 6 RIP as funds allow

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
C1.3 EDRR implemented for priority invasive species not yet in Tuvalu					
C1.3.6 Promote the use of iNaturalist as a tool for use by communities and schools to improve collection of occurrence information and identification of invasive species	iNaturalist POI project has been set up for Tuvalu and currently has two observations	Promote use of the app through networks (schools, government departments and so on)	NISSAP annual reporting	NISC/IASP	DOE after GEF 6 RIP completion as funds allow
C1.4 Marine and terrestrial (including weeds) invasive species surveillance programmes designed and operational					
C1.4.1 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 for the region and Tuvalu	Terrestrial priority species have been identified (see C1 3.5) but marine species not yet prioritised	Identify marine priority species by end of 2023	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP (to tailor from Marine Biosecurity Toolkit)	GEF 6 RIP (Marine Biosecurity Toolkit) DOF funding after GEF 6 RIP as funds allow
C1.4.2 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 2022	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOMPS DOF	GEF 6 RIP (Marine Biosecurity Toolkit) DOMPS and DOF funding after GEF 6 RIP as funds allow
C1.4.3 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	NISC/IASP DOMPS DOF	GEF 6 RIP (Marine Biosecurity Toolkit) DOMPS and DOF funding after GEF 6 RIP project completion
C1.5 Biosecurity register and records to incorporate invasive species					
C1.5.1 Review prohibited imports and notifiable pests and diseases to ensure they are up to date for invasive species (as mandated in s 79 of the Tuvalu Biosecurity Act 2017)	Prohibited imports currently include breadfruit, banana, papaya, and coconut. Mangoes are banned from Fiji due to Mango Seed Weevil, and Taro and Pulaka from Kiribati are banned due to Taro Beetle	All priority species for prevention are logged as prohibited imports and notifiable pests by end of 2023	NISSAP annual reporting	DOA	DOA operational funding

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
C1.6 Ensure masters are undertaking steps to prevent invasive species leaving ships					
C1.5.1 Environment obligations of masters and captains in s 21(1)(a) of the Tuvalu Biosecurity Act 2017 require masters to take "*all necessary steps* to prevent any animal on board the vessel from making contact with any animal on shore unless permitted by a biosecurity officer, and then only as directed by the officer". Necessary steps should include regional best practice actions for biosecurity on ships	Masters are meeting required steps Rope guards are currently in place on wharf Currently ships are allowed to offload at night (this is a risk for CRB)	Best-practice guidelines to be identified by end of 2023 DOA to implement best practice guidelines by end of 2023 (if needed)	NISSAP annual reporting	NISC/IASP DOA PRISMSS POI Other PRISMSS partners (such as PFP, for best practice advice)	GEF 6 RIP for best practice DOA operational funding
C1.7 Ongoing surveillance for CRB					
C1.7.1 Conduct surveillance using CRB traps Continue prohibition of coconut imports Prohibit night offloading of ships according to captains s 21(1)(a) of the Tuvalu Biosecurity Act 2017	Surveillance for CRB is undertaken in Funafuti when pheromones are available Night offloading is permitted for all vessels	Offloading at night is not allowed for ships from CRB-infested areas by end of 2023 CRB is prevented from entering Tuvalu	NISSAP annual reporting	DOA PRISMSS POI (SPC) for advice and pheromones	Department budget
C1.8 Ongoing surveillance of myna birds					
C1.8.1 Conduct visual surveillance as part of EDRR activities	Surveillance for myna birds is undertaken in Funafuti	Regular surveillance undertaken by end of 2023	NISSAP annual reporting	DOA PRISMSS PFP for advice on eradication	Department budget

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
C2.1 Continue control programme for Yellow Crazy Ants					
C2.1.1 Document target sites, baselines, and results of control programmes Yellow Crazy Ant control programmes on at least Funafuti Atoll (GEF 6 RIP 3.1.2)	As per Yellow Crazy Ant Management Plan for Tuvalu 2016, work focussed on Funafuti atoll (Fongafale and Fualopa motu) and Nukulaelae atoll (Fangaua, Motala, and Tumiloto motu) Some parts of Niulakita. Nui, Nukufetau, Nanumaga, and Niutao were also treated Baselines were logged in 2016	Update list of target sites, baselines, and results to date by end of 2023	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOA	GEF 6 RIP for treatment product DOA operational funding for control effort as funds allow Other sources
C2.1.2 Report on baselines and monitoring of control to inform on future activities	Target for C2 1.1	Ongoing. After each round of control, note change in Yellow Crazy Ant abundance for the site	GEF 6 RIP reporting NISSAP annual reporting	NISC/IASP DOA	GEF 6 RIP for treatment product DOA operational funding for ongoing effort as funds allow
C2.2 Sustainable rodent control programmes established					
C2.2.1 Develop plan for rodent control programme including identification of target sites, treatment and monitoring plans, and standard operating procedures (SOPs)	No plan for control programmes for rodents	Plan developed by end of 2023	NISSAP annual reporting	DOA DOE PRISMSS PFP support	To be determined
C2.2.2 Sustainable rodent control programme implemented at target sites	No control programmes for rodents	Programme activities commence by end of 2023	NISSAP annual reporting	DOA DOE PRISMSS PFP support	To be determined

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
C2.2 Sustainable rodent control programmes established					
C2.2.3 Ongoing monitoring of rodent abundance at target sites	No baseline for monitoring	Monitoring reveals reductions in rodent abundance at target sites	NISSAP annual reporting	DOA DOE PRISMSS PFP support	To be determined
C2.3 Sustainable control programme established for insect pests of food crops (coconut scale and fruit flies)					
C2.3.1 Develop plan for crop pest control programme including identification of target sites, treatment and monitoring plans, and SOPs	No plan for control programmes for crop pests	Programme developed by end of 2023	NISSAP annual reporting	DOA PRISMSS POI (SPC) support	DOA operational funding for ongoing effort as funds allow
C2.3.2 Crop pest control programme implemented at target sites	No control programmes for crop pests	Programme activities commence by end of 2023	NISSAP annual reporting	DOA Kaupule PRISMSS POI (SPC) support	DOA operational funding for ongoing effort as funds allow
C2.3.3 Ongoing monitoring of crop pests at target sites	No baseline for monitoring	Monitoring reveals reductions in crop pest abundance at target sites	NISSAP annual reporting	DOA Kaupule PRISMSS POI (SPC) support	DOA operational funding for ongoing effort as funds allow
C2.4 Sustainable control programme established for kou leaf worm					
C2.4.1 Develop plan for kou leaf worm control programme including identification of target sites, treatment and monitoring plans, and SOPs	No control programmes for kou leaf worm	Programme developed by end of 2023	NISSAP annual reporting	DOA PRISMSS POI (SPC) support	DOA
C2.4.2 Kou leaf worm control programme implemented at target sites	No control programmes for kou leaf worm	Programme activities commence by end of 2023	NISSAP annual reporting	DOA Kaupule PRISMSS POI (SPC) support	DOA operational funding for ongoing effort as funds allow
C2.4.3 Ongoing monitoring of kou leaf worm at target sites	No baseline for monitoring	Monitoring reveals reductions in kou leaf worm abundance at target sites	NISSAP annual reporting	DOA Kaupule PRISMSS POI (SPC) support	DOA operational funding for ongoing effort as funds allow

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
C2.5 Sustainable control programme established for cane toad					
C2.5.1 Develop plan for cane toad control programme including identification of target sites, treatment and monitoring plans, and SOPs	No plan for control programmes for cane toad	Plan developed by end of 2023	NISSAP annual reporting	DOA DOE PRISMSS support	To be determined
C2.5.2 Sustainable cane toad programme implemented at target sites	No control programmes for cane toad	Programme activities commence by end of 2023	NISSAP annual reporting	DOA DOE PRISMSS support	To be determined
C2.5.3 Ongoing monitoring of cane toad abundance at target sites	No baseline for monitoring	Monitoring reveals reductions in cane toad abundance at target sites	NISSAP annual reporting	DOA DOE PRISMSS support	To be determined
C2.6 Benefits of rodent eradication demonstrated for priority islands					
C2.6.1 Feasibility and operational plans written for selected target islands (four). May be expanded to six islands if additional funds secured The focus is on protecting habitat for endangered species (GEF 6 RIP 3.2.2). Green Turtle (*Chelonia mydas*) and Hawksbill Turtle (*Eretmochelys imbricata*); seabirds; coastal and marine ecosystems	No eradication plans in place	Feasibility plans complete by September 2023 Operational plans complete by October 2023 Timeframe dependent on COVID	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS PFP (Island Conservation) NISC/IASP	GEF 6 RIP Other funding (to enable eradication on other priority islands)
C2.6.2 Rodent eradications carried out and assessed, and post-operational monitoring regimes written and established (GEF 6 RIP 3.2.2)	No eradications have been undertaken	Eradications carried out by end of 2024 Timeframe dependent on COVID-19 response	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS PFP (Island Conservation) NISC/IASP Kaupule	GEF 6 RIP
C2.6.3 Ongoing monitoring post-rodent eradications (GEF 6 RIP 3.2.2)	No eradications have been undertaken	Ongoing monitoring finds no evidence of rodents Outcomes demonstrate benefits	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS PFP (Island Conservation) NISC/IASP Kaupule	GEF 6 RIP

ACTIVITIES	BASELINE	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
C2.7 Species led weed control or biological control					
C2.7.1 Species-led weed-control plans developed for three weed species in priority sites (GEF 6 RIP 2.1.2)	No weed-control plans in place	Timeframe dependent on COVID-19	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS WOW (SPREP) and/or NENS NISC/IASP	GEF 6 RIP
C2.7.2 Species-led weed-control plans implemented (GEF 6 RIP 2.1.2)	No weed-control plans in place	Timeframe dependent on COVID-19	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS WOW (SPREP) and/or NENS NISC/IASP Kaupule	GEF 6 RIP
C2.7.3 Ongoing monitoring post 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 (SPREP) and/or NENS NISC/IASP Kaupule	GEF 6 RIP
C2.8 Crown-of-thorns ongoing control					
C2.8.1 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 managing nutrient addition should be incorporated in the plan Marine Biosecurity Toolkit may have information	No specific control plans in place	Plan developed by end of 2023	NISSAP annual reporting	DOF NISC/IASP Kaupule	DOF operational funding as funds allow GEF 6 RIP (Marine Biosecurity Toolkit)
C2.8.2 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	DOF NISC/IASP Kaupule	DOF operational funding as funds allow

9.3.2 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	TARGET	VERIFICATION	RESPONSIBILITY	FINANCING
C3.1 Restoration projects initiated for priority motu/atolls					
C3.1.1 Identify two restoration sites in priority atolls (GEF 6 RIP 3.2.3)	No restoration sites	Two sites identified by end of 2023	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS RERC (SPREP) NISC/IASP	GEF 6 RIP 3.2.3
C3.1.2 Develop restoration plans with participation of Kaupule and communities of sites selected. Note that restoration plans should ideally be based on Pacific regional best practice approaches and include monitoring plans (GEF 6 RIP 3.2.3)	No restoration plans	Two restoration projects active by mid-2024 Timeframe dependent on COVID-19	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS RERC (SPREP) NISC/IASP	GEF 6 RIP
C3.1.3 Commence restoration activities with Kaupule and communities (GEF 6 RIP 3.2.3)	No restoration activities	Two restoration projects active by mid-2024 Timeframe dependent on COVID-19	GEF 6 RIP reporting NISSAP annual reporting	PRISMSS RERC (SPREP) NISC/IASP	GEF 6 RIP

Planting of seedlings at Conservation Islet.

10 MONITORING AND EVALUATION

The Department of Environment 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.
All the applicable columns from the Action Tables are included in the left-hand columns.
Each year, status information is added to the right-hand columns.

ACTIONS	2023	2024	2025	2026	2027
A1.1 Awareness and outreach programmes are designed and implemented					
A1.2 Make invasive species information publicly available					
A1.3 Incorporate invasive species into primary and secondary education					
A2.1 A National Invasive Species Coordinator (NISC) is appointed					
A2.2 Ongoing oversight by the Technical Advisory Group (TAG) on invasive species issues					
A2.3 Participate in knowledge-sharing through PILN meetings and communications					
A2.4 Funding is available to carry out the NISSAP activities					
A2.5 National invasive species teams include extension officers					
A2.6 Quarantine (biosecurity) training to improve national border and inter-island biosecurity					
A2.7 Structured national invasive species/biosecurity annual work programmes implemented					
A3.1 Review and revise NISSAP for Tuvalu	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	
A3.2 Strengthened regulations and policies in place					
A3.3 Ballast Water Strategy, statute, and regulations					
B1.1 Biodiversity baseline surveys (marine and terrestrial) established and repeated as required					
B1.2 Collection and sharing of biodiversity information					
B2.1 Risk profiles for the most important invasive species threats completed					

ACTIONS	2023	2024	2025	2026	2027
B3.1 Estimate economic impact of invasive species to Tuvalu					
B3.2 Use available research to guide prevention and management of priority species					
C1.1 International biosecurity infrastructure strengthening					
C1.2 Domestic and International invasive species pathways secured					
C1.3 EDRR implemented for priority invasive species not yet in Tuvalu					
C1.4 Marine and terrestrial (including weeds) invasive species surveillance programmes designed and operational					
C1.5 Biosecurity register and records to incorporate invasive species					
C1.6 Ensure masters are undertaking steps to prevent invasive species leaving ships					
C1.7 Ongoing surveillance for CRB					
C1.8 Ongoing surveillance of myna birds					
C2.1 Continue control programme for Yellow Crazy Ants					
C2.2 Sustainable rodent control programmes established					
C2.3 Sustainable control programme established for insect pests of food crops (coconut scale and fruit flies)					
C2.4 Sustainable control programme established for kou leaf worm					
C2.5 Sustainable control programme established for cane toad					
C2.6 Benefits of rodent eradication demonstrated for priority islands					
C2.7 Species led weed control or biological control					
C2.8 Crown-of-thorns ongoing control					
C3.1 Restoration projects initiated for priority motu/atolls					

Photo: P. McDonald

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12 ANNEXES

12.1 ANNEX 1 Priority invasive species for management in Tuvalu

PLANTS

Singapore Daisy/Wedelia *Sphagneticola trilobata*	Widespread. Used rarely for making fou (garlands). Strong coloniser of open areas and well-lit forests. Breeding sites for rats.
Saketa lau liki/Mile-a-minute *Mikania micrantha*	Widespread. Used for composting and medicines. Locals would not want this species eradicated.
Mouku talatala/Burrgrass *Cenchrus echinatus*	Widespread. The spiny burrs are not toxic but cause traumatic injury to people and animals.
Tuuteu/Money Plant/Devil's Ivy *Epipremnum pinnatum* cv. *'Aureum' (Scindapsus)*	Distribution in Tuvalu is uncertain. The potential impact is greater than widely recognised, and biological control is a potential option.
Leucaena leucocephala	Mentioned in the GEF 6 RIP project document as a priority for biocontrol or conventional weed control. To be confirmed with input from the TAG.
Mimosa pudica	Mentioned in the GEF 6 RIP project document as a priority for biocontrol or conventional weed control. To be confirmed with input from the TAG.
Senna occidentalis	Mentioned in the GEF 6 RIP project document as a priority for biocontrol or conventional weed control. To be confirmed with input from the TAG.
Sesbania cannabina	Mentioned in the GEF 6 RIP project document as a priority for biocontrol or conventional weed control. To be confirmed with input from the TAG.

MAMMALS

Black/Ship Rat *Rattus rattus*	Widespread – all habitats; higher numbers in forest than Polynesian rats.
Kuma Kimoa/Pacific Rat *Rattus exulans*	Widespread – all habitats.
Brown/Norwegian Rat *Rattus norvegicus*	Widespread – all habitats.

INSECTS

Taro leafhopper *Tarophagus calocasiae proserpina*	A biocontrol program is in place where it has established in Funafuti and Vaitupu. This species is not in the ISSG or CABI lists for Tuvalu.
Yellow Crazy Ant *Anoplolepis gracilipes*	Widespread and subject to damaging outbreaks. These ants kill Uu, mud crabs, and other land crabs as well as a range of insects. A management program is ongoing.
Coconut Scale *Aspidiotus destructor*	Present only in Nanumaga and Vaitupu Islands. They damage food crops such as breadfruit, sweet potato, banana, pawpaw, and coconut. A biocontrol has been introduced.
Fruit flies *Bactrocera xanthode* and *B. Passiflorae* lighter form	*Bactrocera xanthode* is present only on Niulakita, while *B. passiflorae* is present on all the islands except Niulakita. They damage breadfruit, papaya, and banana.
Pink mealy bug *Macinellicocus hirsutus*	Damage breadfruit and vegetables.
Mosquitoes *Culex* and *Aedes* spp.	Present on all the islands. Carrier of avian influenza, dengue, chikungunya, and yellow fever.
Black Mirid Garden Flea hopper *Halticus minutus*	Damage garden vegetables and creeping plants.

REPTILES AND AMPHIBIANS

Cane Toad *Rhinella marina*	Present on Nanumaga, Vaitupu, Nukufetau, and Funafuti. No management being undertaken or biosecurity controls to prevent spread.

MARINE

Mozambique Tilapia *Oreochromis mossambicus*	Located in one pond in Funafuti. Prey on native fish fry (milkfish). Used as a protein source for pig feed. Pond is polluted by pig excrement so not used for human consumption. Also found in Nanumaga but not used by people.
Crown-of-thorns Starfish *Acanthaster planci*	Native species that can experience population outbreaks that can damage coral reef functioning. Outbreaks often caused by nutrient addition (waste). Subject to periodic control.

Discussion on the Impact of Invasve Species.

12.2 ANNEX 2 Priority invasive species for prevention from Tuvalu

PLANTS	
All invasive plants	Any invasive plant species not yet in Tuvalu.
MAMMALS	
Indian Grey Mongoose *Herpestes indica*	Present in Hawai'i and Fiji with recent incursions in several other Pacific countries.
Asian Black Rat *Rattus tanzenumi*	From Eastern Asia. Several incursions on Pacific islands via fishing boats and wrecks.
Flying Fox unspecified species	Flying foxes are native to the Pacific and endangered, but people are concerned about their impacts if they arrived in Tuvalu.
BIRDS	
Myna Birds (Family Sturnidae)	Several species established throughout the Pacific, including in Hawai'i Common Myna (*Acridotheres tristis)* and Hill Myna (*Gracula religiosa*) and in Fiji Common Myna and Jungle Myna (*Acridotheres fuscus*).
Red-vented Bulbul *Pycnonotus cafer*	Abundant in Fiji and widespread in the Pacific.
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, Hawai'i, and Fiji), House Sparrow (established in Hawai'i and Fiji), and House Finch (established in Hawai'i).
INSECTS/INVERTEBRATES	
Coconut Rhinoceros Beetle *Oryctes rhinoceros*	Established throughout much of the Pacific. Has a damaging genetic form that is found in Guam, Vanuatu, Solomon Islands, and Papua New Guinea.
Little Fire Ant *Wasmannia auropunctata*	Established on Guam and Hawai'i as well as elsewhere in the Pacific. Has the potential to harm biodiversity and impact agricultural activities. Tramp ants in general are a concern.
Red Imported Fire Ant *Solenopsis invicta*	Established in several Pacific rim countries, such as USA, Japan, China, Australia (Brisbane), Republic of Korea, and occasionally intercepted in New Zealand. Causes devastating socio-economic and environmental damage.
Wasps	Found in New Zealand, Kiribati, and Hawai'i.
Taro Beetle *Papuana* sp.	Established in several countries in the Pacific including Kiribati.
Giant African Snail *Achatina fulica*	Found in Samoa and regularly intercepted in Fiji. 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.
REPTILES/AMPHIBIANS	
Brown Treesnake *Boiga irregularis*	Established on Guam where it has caused extensive damage, impacting biodiversity, economy, and human health. Other reptiles are also undesirable.
MARINE SPECIES	
All marine species	Priorities to be determined from the Marine Biosecurity Toolkit

12.3 ANNEX 3 Priority sites

Kogaa koga puipuigina o Funafuti	▶	Marine conservation area Funafuti. Replanting of corals through Ridge to Reef project
Koga tapu	▶	Marine Managed Area Nukufetau
Koga koga sai ote fenua	▶	Fisheries Reserve Nukulaelae
Koga Tapu o Nanumea	▶	Marine Managed Area Momea Tapu
Terikiai Nui	▶	Marine Conservation Area Nui
Koga tausi ote fenua	▶	Proposed Coastal, Marine and Terrestrial Conservation Area Vaitupu

Photo: A. Carvan

12.4 ANNEX 4 Consultations for NISSAP development

The consultation process was crucial in the development of the NISSAP.

12.4.1 Initial NISSAP pre-draft consultations

The National Invasive Species Coordinator (IASP) held initial consultations with approximately 15 community and government representatives on Funafuti Island from mid-February to the first week of April 2020. A follow-up and a half-day consultation with the six staff of the Department of Agriculture was also held in March 2020. Five participants interviewed were from Vaitupu Island, one was from Niutao Island, and one was from Nanumaga Island (the latter are both former prominent agriculturalists from the Department of Agriculture).

It is important to note that the lifestyles, or traditional ways of living and doing things, are generally the same on all the islands of Tuvalu, thus there would probably have been no significant difference in results if the initial consultations had been held on the other islands.

Formal interviews or informal conversations were used to collect data during the fieldwork stage. Interviewing allowed the NISC to interact and deeply discuss, collect information, and learn from participants. The participants in formal interviews (individual and focus group) were selected from different communities on Funafuti Island (Tuvalu's capital) and government (the public sector) as well.

The NISC also had informal or unplanned interviews and conversations with community people and governmental officials who were met in passing on roads, beside their homes, at social functions, or elsewhere. These informal conversations provided valuable information and knowledge related to invasive species awareness and opinions. Interestingly, informal interviews or conversations were more relaxed, that is people were more open and quicker to respond, in comparison to participants in formal interviews.

The key questions that guided the consultations were:

1. Do you know what invasive species are? Or what do you know about invasive species?
2. What are the invasive species you know or are aware of, under the three (3) major categories below, that affect our biodiversity?
    i Pests
    ii Plants and Weeds
    iii. Marine
3. What are the causes of the introduction of invasive species?
4. What are the ways you think can help in reducing the risk of Invasive species?
5. Do you agree with the full eradication of invasive species? Why or why not?
6. Do you have any other things to say or further comments about invasive species and their impacts here in Tuvalu?

PARTICIPANTS AT FUNAFUTI COMMUNITY AND GOVERNMENT REPRESENTATIVE NISSAP CONSULTATIONS

NAME OF PARTICIPANT	ORGANISATION	GENDER	YOUTH?
Tavau Teii	Niutao Community	M	N
Itaia Lausaveve	Tuvalu National Private Sector	M	N
Siaosi Finiki	Funafuti Community	M	N
Tufoua Panapa	Ministry of Education, Youth and Sports	M	N
Timoteo Panapa	Nanumaga Community	M	N
Kepa Siose	Ministry of Health, Gender and Social Welfare	M	N
Olepa Siniala	Vaitupu Women Community	F	N
Tupulaga Poulasi	Fisheries Department	M	N
Nito Taulu	Marine Department	M	N
Feagaiga Penivao	Ridge to Reef Project	M	N
Elia Lafai	Agriculture Department (Vaitupu)	M	N
Vine Sosene	Health Department	M	N
Ituaso Puapua	Vaitupu Community	M	N
Manu Peniamina	Kaupule Vaitupu	M	N
Maleko Lamese	Vaitupu (Farmer)	M	N

PARTICIPANTS AT FUNAFUTI AGRICULTURE NISSAP WORKSHOP

NAME OF PARTICIPANT	ORGANISATION	GENDER	YOUTH?
Selotia Loisio	Agriculture Department (Funafuti)	F	N
Evolini Sakaio	Agriculture Department (Funafuti)	F	N
Fakapoga Fakapoga	Agriculture Department	M	N
Toeaso Feso	Agriculture Department	F	N
Semisi Tonga	Agriculture Department	M	N
Tulumanu Safega	Agriculture Department	M	N

OUTCOMES OF INITIAL CONSULTATIONS

Below is a summary of the discussions with participants, showing responses and/or recommended actions raised.

QUESTIONS	RESPONSE	SUGGESTED ACTIONS
1. Do you know what invasive species are? What do you know about invasive species?	▪ Most of the participants have an understanding of or knew something about Invasive Species ▪ Mostly learned and heard from awareness programs by the Department of Agriculture	▪ More awareness programs ▪ Liaise and work more closely with the government (agriculture, fisheries, environment, marine departments, and so on)
2. What are the Invasive species you know or are aware of, under the three (3) major categories that affect our biodiversity?	**i. PESTS** Kimoa — Rats Milipaki piniki — Pink mealybug Lane — Cane toads Te unafi sega — Coconut scale insect Lago o fuaga lakau — Fruit flies Lo makinikini — Yellow crazy ant Te Filii uli — Black mirid flea hopper Kinauele — Taro leaf hopper Anufe — Kou leaf worm *???* — Brown leaf spot	Agriculture to provide a list of pests present in Tuvalu and in neighbouring countries such as Fiji and Kiribati
	ii. WEEDS Metilia — Wedelia Fue piniki — Beach morning glory Saketa lauliki — Mile a minute Saketa — Beach pea Fetai — Beach dodder Fue kena — Wild moon flower Mouku kona — Saltgrass Kaipuaka — Lantana Mouku talatala — Burrgrass Mouku — Bunchy sedge	Agriculture to provide a list of weeds present in Tuvalu and in neighbouring countries such as Fiji and Kiribati
	iii. MARINE Kamu — Crown-of-thorns Liimu — Brown seaweed	Fisheries and Marine Departments to provide a list of marine invasive species present in Tuvalu and in neighbouring countries
3. What are the causes of the introduction of invasive species?	▪ Smuggling ▪ Passengers do not declare (intentionally or unintentionally) their products, upon arrival ▪ Ballast water from ships ▪ No import permits and fumigation certificates ▪ Quarantine officers are not strictly following quarantine procedures ▪ Lack of facilities and equipment (fumigation, baggage scanner, and so on) ▪ Lack of capacity – knowledge and human resource	▪ People to comply with the Agriculture Quarantine guidelines/procedures ▪ Passengers to honestly declare their products ▪ Quarantine officers to strictly comply to their duties (“No Family, No Friend” approach) ▪ Government/Invasive Alien Species Project (IASP) to provide adequate funds for necessary facilities and equipment ▪ Training and awareness

QUESTIONS	RESPONSE	SUGGESTED ACTIONS
4. What are the ways you think can help in reducing the risk of invasive species?	▪ People to be honest mainly when bringing into the country items that may introduce or enhance invasive species. ▪ Strictly comply with Agriculture guidelines and procedures ▪ Working together (genuine partnership) of various interested parties ▪ Landowners to report to Department of Agriculture any suspicious matter that they may observe/ detect on their land (plants and soil) as soon as possible ▪ Control, manage, and monitor ships' biofouling to minimise the transfer of invasive aquatic species ▪ Quarantine officers to be strict	▪ Organise more radio and public awareness programmes to relay the risk of Invasive species ▪ Respond as early as possible to any report ▪ Prevent the spread and impact of invasive alien species by strictly complying to quarantine procedures and so on ▪ Government/IASP to provide adequate funds for controlling the Invasive species. ▪ People (interested parties) to work together
5. Do you agree with the full eradication of invasive species? Why or why not?	▪ Agreed to fully eradicate the pests ▪ Some disagreed to fully eradicate the weeds, as weeds are useful for medicines, compost, protecting soil erosion, keeping soil moisture, and so on	▪ Landowners to work together with Agriculture and IASP team to provide technical views on the advantages and disadvantages of the 'full eradication' approach
6. Do you have any other things to say or further comments about invasive species and their impacts here in Tuvalu?	▪ Agriculture, Fisheries, Marine and Environment departments and other relevant interested parties should work together to: ▪ protect the country from introducing invasive species and ▪ minimise the impacts of IAS on our environment and economy. ▪ Maintain a consistent training and awareness programme to encourage the people to assist and comply with the Biosecurity guidelines and conditions. ▪ Agriculture and biosecurity concepts to be taught in all schools and included in the school curriculum at all levels. ▪ Conduct radio programmes and use the media to build the capacity and knowledge of Tuvaluans on the impact of invasive species on their environment.	▪ Increase budgetary allocation and trainings ▪ Formulate a comprehensive module for both schools and adults through consistent training programmes and workshops ▪ Curriculum streams on Invasive species to be developed ▪ Media campaign on Invasive species. For example, publish pamphlets in the local language to enhance the campaign to protect our biodiversity

12.4.2 EDRR consultations

Consultations were held on 9 March 2021 with a focus group to determine priorities for prevention through early detection and rapid response (EDRR). 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. No other species were identified as priority groups by the focus group.

The EDRR list was presented to the TAG, who wished to add three species: Coconut Rhinoceros Beetle, Taro Beetle, and Flying Fox. Because the EDRR planning is a GEF 6 RIP activity, the scope only includes invasive species of biodiversity concern. Therefore, the letter outlining EDRR priorities was presented to the responsible authorities for endorsement, omitting these three additional species. The responsible authorities are:

- Director of Agriculture
- Director of Customs
- Director of Fisheries
- Director of Public Health
- Director of Marine and Port Services
- Kaupule Secretary Funafuti
- Director of Waste Management
- Director of Local Government.

The EDRR priorities have been endorsed.

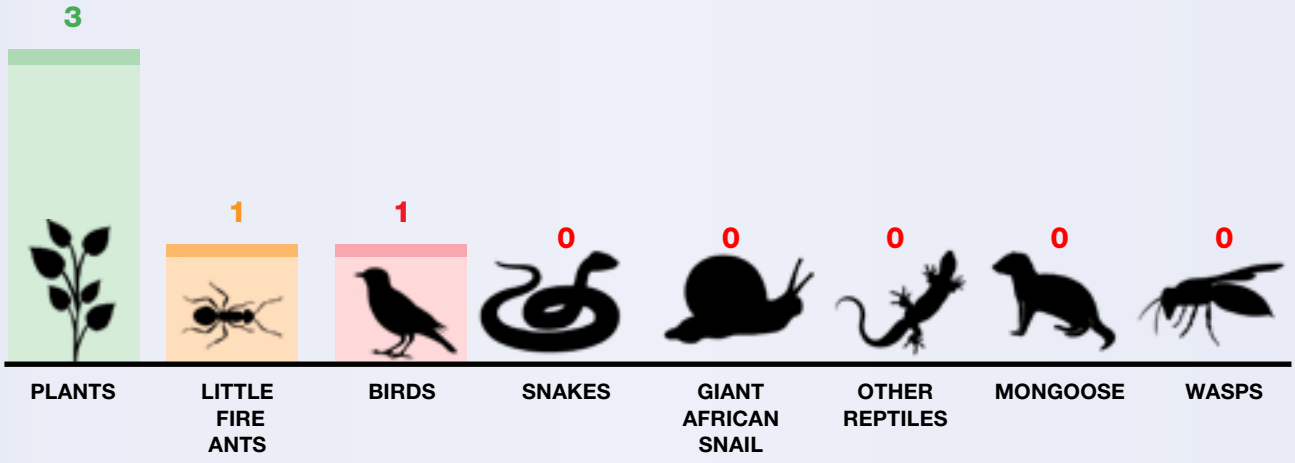
EDRR FOCUS GROUP PARTICIPANTS

NAME OF PARTICIPANT	ORGANISATION	GENDER	YOUTH?
Tilia Tima	Environment Department	F	N
Vine Sosene	Public Health Department	M	N
Falesa Teuila	Marine & Port Department	M	N
Tebeke Teaukai	Custom Department	M	N
Selotia Tausi	Agriculture Department	F	N
Matapua Tali	Fisheries Department	F	N
Saamu Tui	IASP	M	N
Sam Panapa	IASP	M	N

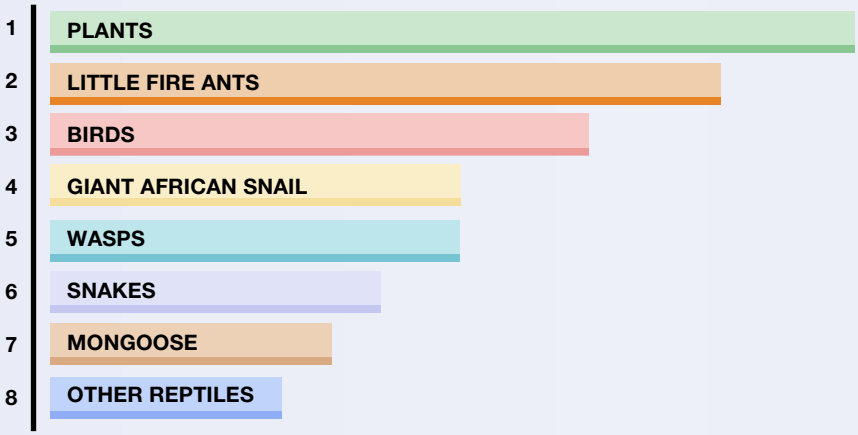
FOCUS GROUP EDRR PRIORITIES

The data columns for priority taxonomic groups are equivalent to the number of responses to an in-session survey, listing the given group, among the eight participants.

WHICH OF THE FOLLOWING TAXONOMIC GROUPS IS THE HIGHEST PRIORITY FOR EDRR IN TUVALU?



PLEASE RANK THE FOLLOWING TAXONOMIC GROUPS FROM HIGH TO LOW PRIORITY FOR EDRR IN TUVALU.



12.4.3 Consultations on the draft NISSAP

National consultations on the draft NISSAP were held between March and December 2022, facilitated by Sam Panapa.

The key questions that guided the consultations were:

1. What invasive species in Tuvalu are you concerned about?
2. Have you heard about these animals and plants before today? (Note: the group of priority species was introduced during the session)
3. Do you have any questions or comments about these groups of animals and plants?
4. What do you think needs to be done to prevent the arrival of invasive species in Tuvalu? (Can choose more than one)
   - More community awareness about the problems invasive species cause
   - Find them as soon as they arrive and get rid of them
   - Better biosecurity on ships that come to Tuvalu
   - Better quarantine (biosecurity) at the airport and ports
   - Stronger fines if people bring them in
   - Stronger restrictions on trade with countries that have these plants and animals
   - Nothing else – I'm not worried about these species
5. Review of the Draft Action Plan – indicate whether you agree/disagree with the actions stated
6. Anything else needed/added to help with

NISSAP consultation in Vaitupu

12.4.3.1 NISSAP consultation in Funafuti

Consultations with government and community representatives and other interested parties were held on 22 March 2022.

PARTICIPANTS AT FUNAFUTI DRAFT NISSAP CONSULTATION

NAME OF PARTICIPANT	ORGANISATION	GENDER	YOUTH?
Tilia Tima	Environment Department	F	N
Alitake Alefaio	Funafuti Youth	F	Y
Kaiau Niu	Funafuti Community	M	N
Uluao Lauti	Funafuti Community	M	N
Maseiga Ionatana	Nui Community	F	N
Sumeo Silu	Vaitupu Community	M	N
Tavale Fatasi	Funafuti Community	F	N
Famanatu Simon	Vaitupu Community	F	N
Fialogo Viliamu	Nanumea Youth	M	Y
Sualo Kauani	Nanumea Community	M	N
Launiu Pelosi	Nanumea Community	M	N
Panapasi Nelesone	Nukufetau Community	M	N
Tausaga Ampelosa	Funafuti Community	F	N
Tiale Panapa	Vaitupu Youth	F	Y
Emely S Panapa	Funafuti Youth	F	Y
Kim Viliamu	Nanumea Youth	M	Y
Hilia Vavae	Nanumea Community	F	N

OUTCOMES OF CONSULTATION

Below is a summary of the discussions with participants at the consultations, showing responses and ranking.[27]

[27] Ranking is simply the number of people who supported/gave high priority to a particular species/option

QUESTIONS	RESPONSE	
1. What invasive species in Tuvalu are you concerned about?	**i. PESTS** (ranking)	
	Kimoa	Rats (17)
	Lo makinikini	Yellow crazy ant (13)
	Namu	Mosquitoes (12)
	Lane	Cane toads (11)
	Lo kula	Tropical fire ant (11)
	Kuli	Dogs (10)
	Anufe	Kou leaf worm (9)
	Te unafi sega	Coconut scale insect (9)
	Lago o fuaga lakau	Fruit flies (9)
	Loata (Lo uli)	Ant (9)
	Manu	Jungle Myna (9)
	Kinauele	Taro leaf hopper (8)
	-	Brown leaf spot (8)
	Milipaki piniki	Pink mealybug (7)
	Puusi	Cats (2)
	Mogamoga	Cockroach (2)
	Lago fufu	Wasp (1)
	Pili	Lizard (1)
	ii. WEEDS (ranking)	
	Mouku talatala	Burrgrass (17)
	Mouku matioti	Sensitive grass (16)
	Metilia	Wedelia (15)
	Saketa lauliki	Mile a minute (10)
	Tamalini	Wild tamarind (10)
	iii. MARINE (ranking)	
	Liimu	Brown seaweed (17)
	Kamu	Crown-of-thorns (12)
2. Have you heard about these animals and plants before today? (Note: the EDRR priority species were introduced)	All participants heard of these animals and plants, and some of them do not know the severe harm they can cause	
3. Do you have any questions or comments about these groups of animals and plants?	What are the advantages we get from these animals when they are alive or dead?	
	Can the animal be affected when they eat a dead animal that was poisoned?	
	Invasive Species that are present have to be controlled/eradicated	
	To protect Tuvalu from these animals	
	Quarantine officers to strictly comply with their duties at the wharf and airport	
4. What do you think needs to be done to prevent the arrival of invasive species in Tuvalu?	Seventeen people support 1 (More community awareness about the problems invasive species cause) and 5 (Stronger fines if people bring them in).	
	Sixteen people support 3 (Better biosecurity on ships that come to Tuvalu) and 4 (Better biosecurity at the airport and ports).	
	Five people support 2 (Find them as soon as they arrive and get rid of them) and 6 (Stronger restrictions on trade with countries that have these plants and animals).	

QUESTIONS	RESPONSE
5. The Draft Action Plan Whether you agree or disagree with the actions stated	**A1 – Generating support** They all agree
Anything else needed or added to help with	Create posters/flyers of invasive species for public awareness and placed them at the airport, wharf, and public places To develop a book of invasive species in Tuvaluan and make copies available at the library and school libraries Create a website for all invasive species present and absent that potentially harm the environment and people's lives
Agree/disagree	**A2 – Building Capacity** They all agree
Needed/added	A Vet is needed to operate on (neuter) female dogs and cats Baggage scanner, fumigation facilities, and quarantine shed are needed Funds to be available for every year Increase budgetary allocation for training.
Agree/disagree	**A3 – Legislation, Policy and Protocols** They all agree
Needed/added	Review the policy Include a fine on the spot To strengthen Island bylaws Strict penalties
Agree/disagree	**B1 – Baseline and Monitoring** They all agree
Needed/added	Carry out the survey every four years Report any matter/damage found/seen on the plants
Agree/disagree	**B2 – Prioritisation** They all agree
Needed/added	Each island to urge and prioritize their pest or plant to be controlled
Agree/disagree	**B3 – Research on priorities** They all agree
Needed/added	People to agree and be in harmony with Agriculture procedures Use the old research that has been tried elsewhere and worked well Need an expert to carry out the research
Agree/disagree	**C1 – Biosecurity** They all agree
Needed/added	Quarantine officers have to be strict People have to work together in protecting the country Forbid the release of ballast water in the lagoon Find the best way of protecting the country that suits our situation Select a committee

QUESTIONS	RESPONSE
Agree/disagree	**C2 – Management of established invasive**
	They all agree
Needed/added	To strengthen the programs for controlling the invasive species
	The Liimu have to be collected and used for compost
	To find the best way of controlling invasive species that suits our condition
Agree/disagree	**C3 – Restoration**
	They all agree
Needed/added	To carry out a survey on all the islands to know/recognize the sites that are severely affected
	To plant trees to protect soil erosion
	To control/eradicate the rats and yellow crazy ants as it's really disturbing the toddy cutters

12.4.3.2 NISSAP consultation in Nukulaelae

Consultations with community representatives were held on 9 September 2022.

PARTICIPANTS AT NUKULAELAE DRAFT NISSAP CONSULTATION

(All are members of the **Nukulaelae** community)

NAME OF PARTICIPANT	GENDER	YOUTH?
Sokomani Ioane	M	
Teoli Aluna	M	
Siale Liva	M	
Silo Faalata	M	
Sene Enoka	M	Y
Iosia Filiki	M	
Galuafi Moeava	M	
Mailagi Mapusaga	M	
Fiavaai Tinei	M	
Nukuolo Fiavai	F	Y
Tavita Melite	M	
Afasene Laipe	F	
Auega Faauila	M	
Pesaleli Eneli	M	
Pule Tataa	M	
Taaku Sekielu	M	
Tele Siamua	M	

NAME OF PARTICIPANT	GENDER	YOUTH?
Kitele Tausegia	F	
Selau Toematagi	M	
Litia Tauemua	F	Y
Falagai Ulukoloa	M	Y
Tapuaiga Iosefa	M	
Savali Tausegia	F	
Rueben Kausea	M	Y
Peleseti Folitau	F	
Silitone Sio	M	Y
Salati Siale	F	Y
Melinda Siale	F	Y
Vaega Eliuta	M	Y
Kilotonu Petelu	M	Y
Paki Apelu	M	Y
Pouleta Uatea	M	
Kaulaka Fiavaai	F	
Cronita Petelu	F	Y

OUTCOMES OF CONSULTATIONS

Below is a summary of the discussions with participants at the consultations, showing responses and ranking.[28]

QUESTIONS	RESPONSE	
1. What invasive species in Tuvalu are you concerned about? (ranking)	**i. PESTS** (ranking)	
	Kimoa	Rats (34)
	Lo makinikini	Yellow crazy ant (32)
	-	Red millipede (32)
	Milipaki piniki	Pink mealybug (21)
	Puusi	Cats (21)
	Puaka	Pigs (20)
	Moa	Chicken (14)
	Lago	House flies (14)
	Kinauele	Taro leaf hopper (12)
	Anufe	Cabbage lopper (12)
	Namu	Mosquitoes (11)
	Taki	Duck (4)
	Kaleva	Long-tailed cuckoo (1)
	Mogamoga	Cockroach (1)
	ii. WEEDS (ranking)	
	Mouku talatala	Burrgrass (35)
	Lakau pula sega	Coffee senna (26)
	Fue	Beach morning glory (24)
	Metilia	Wedelia (20)
	Mouku matioti	Sensitive grass (16)
	Saketa	Beach pea (12)
	iii. MARINE (ranking)	
	Liimu	Brown seaweed (17)
	Kamu	Crown-of –thorns (12)
2. Have you heard about these animals and plants before today?	All participants heard of these animals and plants, and most of them do not know the severe harm they can cause	
3. Do you have any questions or comments about these groups of animals and plants?	To protect Nukulaelae from these animals and plants Update the island if there is an outbreak Invasive Species that are present have to be controlled/eradicated	
4. What do you think needs to be done to prevent the arrival of invasive species in Tuvalu?	Thirty-two people support 1–2: 1 (More community awareness about the problems invasive species cause) and 2 (Find them as soon as they arrive and get rid of them). Twenty-eight people support 3–4: 3 (Better biosecurity on ships that come to Tuvalu) and 4 (Better biosecurity at the airport and ports). Eight people support 5–6: 5 (Stronger fines if people bring them in) and 6 (Stronger restrictions on trade with countries that have these plants and animals).	

[28] Ranking is simply the number of people who supported/gave high priority to a particular species/option.

QUESTIONS	RESPONSE
5. The Draft Action Plan	**A1 – Generating support**
Whether you agree or disagree with the actions stated	They all agree
Anything else needed or added to help with	Agriculture to provide posters/flyers of invasive species More awareness of invasive species Develop a book on invasive species in Tuvaluan and make copies available at the Kaupule office
Agree/disagree	**A2 – Building Capacity** They all agree
Needed/added	Workshop on invasive species and their control Funds to be available for every year
Agree/disagree	**A3 – Legislation, Policy and Protocols** They all agree
Needed/added	Review the policy To strengthen Island bylaws
Agree/disagree	**B1 – Baseline and Monitoring** They all agree
Needed/added	Carry out the survey every year Report any insect/damage found/seen on the plants
Agree/disagree	**B2 – Prioritisation** They all agree
Needed/added	Need assistance from any organization to control/eradicate the prioritized pests
Agree/disagree	**B3 – Research on priorities** They all agree
Needed/added	People to agree and be in harmony with Agriculture procedures Need an expert to carry out the research
Agree/disagree	**C1 – Biosecurity** They all agree
Needed/added	Quarantine officers have to be strict Kaupule and people have to work together in protecting the island Find the best way of protecting the island that suits our situation
Agree/disagree	**C2 – Management of established invasive** They all agree
Needed/added	To strengthen the programs for controlling invasive species To find the best way of controlling invasive species that suits our condition
Agree/disagree	**C3 – Restoration** They all agree
Needed/added	To plant trees to protect soil erosion To control/eradicate the rats and yellow crazy ants as it's really disturbing the toddy cutters

12.4.3.3 NISSAP consultation in Vaitupu

Consultations with community representatives were held on 14 December 2022.

PARTICIPANTS AT VAITUPU DRAFT NISSAP CONSULTATION

NAME OF PARTICIPANT	ORGANIZATION	GENDER	YOUTH?
Kaleia Toomu	Kaupule	M	
Taupule Tanelua	Kaupule	F	Y
Talasuni Talava	Women Community	F	
Snowwhite Seelu	Tumaseu Community	F	Y
Uluai Faavae	Tumaseu Community	F	
Mose Taaku	Tumaseu Community	M	
Faavae Sekielu	Tumaseu Community	M	
Kilei Uatali	Tumaseu Community	M	Y
Tui Taumafai	Tumaseu Community	M	
Ariera Fagalele	Kaupule	F	
Daisy Faatasi	Asau Community	F	Y
Samalia Soni	Asau Community	F	
Solama Eti	Asau Community	F	Y
Matalofa Penisula	Tumaseu Community	F	
Faatasi Semeli	Asau Community	M	Y
Pitasi Faimalaga	Kaupule	F	
Noama Kaeula	Tumaseu Community	F	Y
Lupeaga Teanua	Tumaseu Community	F	Y
Rina Saufatu	Asau Community	F	Y
Lupeaga Leuli	Asau Community	F	
Teauoki Auina	Tumaseu Community	M	
Teoti Sosene	Asau Community	M	
Teagi Savelio	Tumaseu Community	M	
Pelusia Tauetia	Kaiga Aliki	M	
Lotomalie Katea	Tumaseu Community	M	Y
Sinamoana Taukiei	Asau Community	F	
Siata Mose	Tumaseu Community	F	
Puanita Toatele	Tumaseu Community	F	Y
Leni Saufatu	Asau Community	F	
Malaea Olive	Tumaseu Community	F	Y
Pualina Teagi	Tumaseu Community	F	Y
Kalepo Falesa	Tumaseu Community	M	
Semi Solomona	Asau Community	M	
Siautele Lito	Asau Community	M	
Ionatana Peia	Asau Community	M	
Ioapa Tekapu	Asau Community	M	
Mose Isaako	Tumaseu Community	M	
Silo Moti	Kaupule	M	
Fineaso Tuu	Agriculture Department	M	
Sumeo Silu	Ministry of Public Works, Infrastructure, Environment, Labour, Meteorology & Disaster	M	
Tevenei Vaeanoa	Transport Department	M	

OUTCOMES OF CONSULTATIONS

Below is a summary of the discussions with participants at the consultations, showing responses and ranking.[29]

QUESTIONS	RESPONSE	
1. What invasive species in Tuvalu are you concerned about? (ranking)	**i. PESTS**	
	Kimoa	Rats (40)
	Lo makinikini	Yellow crazy ant (37)
	Kinauele	Taro leaf hopper (35)
	Loo kula	Singapore ant (28)
	Lane	Cane toads (27)
	Anufe o Kanava	Kou leaf worm (26)
	Te Unafi sega	Coconut scale insect (25)
	Milipaki	Mealybugs (16)
	Lago	House flies (14)
	Namu	Mosquitoes (12)
	Puaka	Pigs (10)
	Moa	Chicken (6)
	Kuli	Dogs (5)
	Puusi	Cats (2)
	Lago fufu	Wasp (1)
	ii. WEEDS	
	Saketa	Beach pea (40)
	Mouku talatala	Burr grass (33)
	Metilia	Wedelia (32)
	Lakau pula sega	Coffee senna (29)
	Fue	Beach morning glory (29)
	Tamalini	Wild tamarind (10)
	Mouku saisai fekei	Bunchy sedge (6)
	Felo te kimoa	Rat tail dropseed (4)
	Mouku fili fou	Sedge/Marsh cypress (1)
	Mutia	Nut grass (1)
	iii. MARINE	
	Nil	
2. Have you heard about these animals and plants before today?	All participants heard of these animals and plants, and most of them do know the severe harm they can cause	
3. Do you have any questions or comments about these groups of animals and plants?	Does the project have the funds, chemicals, tools, and equipment when there is an outbreak of these animals?	
	How can we protect Vaitupu from these animals and plants?	
	If we eliminate all these invasive species, is there any threat posed by eliminating them?	
	Update the island if there is an outbreak	
	Invasive species that are present have to be controlled/eradicated	
	Invasive species must be eliminated properly to avoid killing other beneficial organisms	

[29] Ranking is the number of people who supported/gave high priority to a particular species/option

QUESTIONS	RESPONSE
4. What do you think needs to be done to prevent the arrival of invasive species in Tuvalu?	Forty people support actions 1–6: 1 (More community awareness about the problems invasive species cause); 2 (Find them as soon as they arrive and get rid of them); 3 (Better biosecurity on ships that come to Tuvalu); 4 (Better biosecurity at the airport and ports); 5 (Stronger fines if people bring them in) and 6 (Stronger restrictions on trade with countries that have these plants and animals). Eighteen people support actions 1-5.
5. The Draft Action Plan	**A1 – Generating support**
Indicate whether you agree or disagree with the actions stated	Most of them agree
Anything else needed or added to help with	Few disagree to include in the school curriculum Agriculture to provide training, posters/flyers of invasive species More awareness of invasive species Develop a book on invasive species in Tuvaluan and make copies available at the Kaupule office
Agree/disagree	**A2 – Building Capacity** They all agree
Needed/added	Workshop on invasive species and their control Funds to be available for every year Vaitupu need a fumigation facility and a quarantine shed
Agree/disagree	**A3 – Legislation, Policy, and Protocols** They all agree
Needed/added	Review the policy Enforce the regulations To strengthen Island bylaws More training and workshops
Agree/disagree	**B1 – Baseline and Monitoring** They all agree
Needed/added	Carry out the survey every year Report any insect/damage found/seen on the plants Regular visits of experts to the island
Agree/disagree	**B2 – Prioritisation** They all agree
Needed/added	Funding should always be available Need assistance from any organization to control/eradicate the prioritized pests
Agree/disagree	**B3 – Research on priorities** They all agree
Needed/added	People to agree and be in harmony with Agriculture procedures Need an expert to carry out the research Agriculture staff to make awareness
Agree/disagree	**C1 – Biosecurity** They all agree
Needed/added	Quarantine officers have to be strict Kaupule and the people have to work together in protecting the island Give a reward to anyone who reports anyone who smuggled any animals and plants

QUESTIONS	RESPONSE
Agree/disagree	**C2 – Management of established invasive**
	They all agree
Needed/added	Funds, tools, and equipment should always be available
	To strengthen the programs for controlling invasive species
	To find the best way of controlling invasive species that suits our condition without harming other beneficial organisms
Agree/disagree	**C3 – Restoration**
	They all agree
Needed/added	To plant trees to protect against soil erosion
	Landowners to plant trees on their abandoned lands to make use of their lands
	To plant the kanava trees as most of the kanava trees are dying cause of the kou leaf worm
	To control Invasive species such as rats, yellow crazy ants, taro plant hopper, cane toads, the kou leafworm, etc.

12.4.3.4 NISSAP consultation in Nukufetau

Consultations with community representatives were held on 14 December 2022.

PARTICIPANTS AT NUKUFETAU DRAFT NISSAP CONSULTATION

(All are members of the Nukufetau community)

NAME OF PARTICIPANT	GENDER	YOUTH?
Penima Fapaologa	M	
Ella Lupeni	F	Y
Fuifui Afega	F	Y
Paia Penani	F	
Manisulu Falani	F	Y
Simona Toma	M	
Fatulua Kaino	F	
Seina Ama	F	
Vaeseina Pakasoa	F	
Sunema Ioapo	F	
Leti Paeniu	F	Y
Sose Tefou	F	Y
Kapeni Paeniu	M	Y
Loimata Malo	F	
Vaoloaga Penani	M	Y
Tuatoki Hosea	M	
Utoane Mesu	F	Y
Nelea Kainga	F	
Lelepasi Tusaga	F	Y
Saini Lonesi	F	
Funga Aletima	F	Y
Foini Kaino	F	Y
Joana Tovia	F	

NAME OF PARTICIPANT	GENDER	YOUTH?
Vitolia Keu	F	
Manamea Fakafouga	F	Y
Paulina Lupeni	F	Y
Liese Samuelu	F	
Alesi feagaiga	F	
Matafale Fakafouga	F	
Selesa Lupeni	F	
Losa Pitoi	F	
Elisapeta Filioma	F	Y
Lava Malota	F	Y
Fakafouga Aleke	M	
Filifiliga Teafuila	F	
Peleti Faiana	M	Y
Hosema Hosea	M	Y
Auese Fakavae	F	
Temese Teloko	M	Y
Vine Imasu	F	Y
Teulupe Ian	F	Y
Lisa Simona	F	Y
Miita Lupeni	F	Y
Peleti Tealofi	M	
Tuapine Timena	F	Y
Feleita Afa	F	

OUTCOMES OF CONSULTATIONS

Below is a summary of the discussions with participants at the consultations, showing responses and ranking.[30]

QUESTIONS	RESPONSE	
1. What invasive species in Tuvalu are you concerned about?	**i. PESTS**	
	Lo makinikini	Yellow crazy ant (45)
	Namu	Mosquitoes (42)
	Lane	Cane toads (41)
	Kimoa	Rats (40)
	Anufe o Kanava	Kou leaf worm (40)
	Puaka	Pigs (38)
	???	Brown leaf sport (35)
	Lago o fuaga lakau	Fruit flies (29)
	Kuli	Dogs (9)
	ii. WEEDS	
	Metilia	Wedelia (43)
	Mouku talatala	Burr grass (41)
	Saketa	Beach pea (25)
	iii. MARINE	
	Nil	
2. Have you heard about these animals and plants before today?	All the participants have heard of these animals, and most of them do not know the severity of the damage these animals can cause	
3. Do you have any questions or comments about these groups of animals and plants?	▪ Eliminate these invasive species in order for people and native species in that environment to grow properly in a good condition. ▪ If we eliminate all these invasive species, is there any threat posed by eliminating them? ▪ Invasive species must be eliminated properly to avoid killing other beneficial organisms ▪ Eliminate all invasive species until there are no more left. ▪ Teach our children to protect themselves from these invasive species. ▪ Few problems posed by these invasive species in the olden days compare to nowadays	
4. What do you think needs to be done to prevent the arrival of invasive species in Tuvalu?	All people support actions 1–6: 1 (More community awareness about the problems invasive species cause); 2 (Find them as soon as they arrive and get rid of them); 3 (Better biosecurity on ships that come to Tuvalu); 4 (Better biosecurity at the airport and ports); 5 (Stronger fines if people bring them in) and 6 (Stronger restrictions on trade with countries that have these plants and animals).	

[30] Ranking is the number of people who supported/gave high priority to a particular species/option

QUESTIONS	RESPONSE
5. The Draft Action Plan	**A1 – Generating support**
Indicate whether you agree or disagree with the actions stated	They all agree
Anything else needed or added to help with	Provide training, posters/flyers of invasive species
	More awareness of invasive species
	Provide Nukufetau with a building dedicated to helping people in regard to invasive species
	The people to abide by the rules and regulations
Agree/disagree	**A2 – Building Capacity**
	They all agree
Needed/added	Conduct Workshop on invasive species and their control
	Developing an explanation of living things around us to be distributed among the people
	Really need these types of facilities here in Nukufetau to protect the island and checking of anything that comes and leaves the island.
Agree/disagree	**A3 – Legislation, Policy, and Protocols**
	They all agree
Needed/added	Enforce the regulations
	To strengthen Island bylaws
	More training and workshops
Agree/disagree	**B1 – Baseline and Monitoring**
	They all agree
Needed/added	Carry out the survey every year
	Include local people in the conducting of the survey
	Regular visits of experts to the island
	Provide support on conducting many consultations on collecting and sharing biodiversity information
Agree/disagree	**B2 – Prioritisation**
	They all agree
Needed/added	To prioritize the invasive species which are more dangerous to people
Agree/disagree	**B3 – Research on priorities**
	They all agree
Needed/added	Nukufetau value the development of these types of research for the effect posed by invasive species on our economy
	Develop a plan (rules and regulations) to protect the conservation areas, especially islets
Agree/disagree	**C1 – Biosecurity**
	They all agree
Needed/added	Quarantine officers have to be strict
	To report any outbreak
Agree/disagree	**C2 – Management of established invasive**
	They all agree
Needed/added	To find the best way of controlling invasive species that suits our condition without harming other beneficial organisms
Agree/disagree	**C3 – Restoration**
	They all agree
Needed/added	To plant trees to protect against soil erosion

12.4.3.5 NISSAP consultation with Technical Advisory Group (TAG)

Consultations with the TAG were held on 16 February 2023.

PARTICIPANTS AT FUNAFUTI DRAFT NISSAP CONSULTATION

NAME OF PARTICIPANT	ORGANIZATION	GENDER	YOUTH?
Siliako Letueti	Waste department	M	
Vitolia Paulo	Revenue & Customs department	F	
Valoa Tinilau	Local Government department	M	Y
Sagaga Safega	Youth department	F	
Alitaake Semese	Environment department	F	Y
Tilia Tima	Environment department	F	
Nito Lipine	Marine department	M	
Semese Alefaio	Fisheries department	M	
Puaseiese Pedro	Tuvalu media	F	
Matio Lonalona	Agriculture department	M	
Itaia Lausaveve	Live & Learn department	M	

Below is a summary of the discussions with the TAG, showing responses and ranking.[31]

QUESTIONS	RESPONSE	
1. What invasive species in Tuvalu are you concerned about?	**i. PESTS**	
	Kimoa	Rats (10)
	Lo makinikini	Yellow crazy ant (6)
	Milipaki	Mealybugs (5)
	Lane	Cane toads (5)
	Anufe o Kanava	Kou leaf worm (4)
	Loo kula	Tropical fire ant (4)
	Namu	Mosquitoes (3)
	Lago	House flies (2)
	Kuli	Dogs (2)
	ii. WEEDS	
	Metilia	Wedelia (4)
	Mouku talatala	Burr grass (4)
	iii. MARINE	
	Limu	Sargassum polycystum (2)
	Kamu	Crown-of-thorns Starfish (2)

[31] Ranking is the number of people who supported/gave high priority to a particular species/option

QUESTIONS	RESPONSE
2. Have you heard about these animals and plants before today?	All participants heard of these animals and plants, and most of them do know the severe harm they can cause
3. Do you have any questions or comments about these groups of animals and plants?	Does the project have the funds, chemicals, tools, and equipment when there is an outbreak from these animals? Invasive Species that are present have to be controlled/eradicated
4. What do you think needs to be done to prevent the arrival of invasive species in Tuvalu?	All people support actions 1–6: 1 (More community awareness about the problems invasive species cause); 2 (Find them as soon as they arrive and get rid of them); 3 (Better biosecurity on ships that come to Tuvalu); 4 (Better biosecurity at the airport and ports); 5 (Stronger fines if people bring them in) and 6 (Stronger restrictions on trade with countries that have these plants and animals).
5. The Draft Action Plan	**A1 – Generating support**
Indicate whether you agree or disagree with the actions stated	All agree
Anything else needed or added to help with	Agriculture to provide training, posters/flyers of invasive species More awareness of invasive species Regulate pests/diseases of interest to limit, control, and confine pests/diseases within their infected location from spreading to other parts of the island and country
Agree/disagree	**A2 – Building Capacity** All agree
Needed/added	Workshop on invasive species and their control Funds to be available for every year Develop in-country capacity-building activities addressing key threats that are of national interest All potential ports of entry in Tuvalu should be equipped. Kaupule and Kaiga-Aliki who are key decision-makers in all the rural communities should have a fair understanding and be able to contribute as well especially in alerting key or focal points of the IAS Agents /authorities
Agree/disagree	**A3 – Legislation, Policy, and Protocols** All agree
Needed/added	Review the policies Enforce the regulations More training and workshops Need to control and confine such pest/disease outbreaks from further expansion to other parts of the island and nation. This can be effectively done if these pests/diseases are regulated by law
Agree/disagree	**B1 – Baseline and Monitoring** All agree
Needed/added	Carry out the survey every year Report any insect/damage found/seen on the plants Monitoring and evaluation regularly to understand the situation, movement, and extent of pests/diseases populations, infestation, etc.

QUESTIONS	RESPONSE
Agree/disagree	**B2 – Prioritisation**
	All agree
Needed/added	Funding should always be available
	Effective surveillance activities to closely monitor and report on the situation of targeted pests/diseases
	More awareness and better access to public information
Agree/disagree	**B3 – Research on priorities**
	All agree
Needed/added	People to agree and be in harmony with Agriculture procedures
	Need an expert to carry out the research
	Social and environmental impact needs to be considered as well in the research activities
	Need to explore other options such as traditional knowledge linking it to such priorities
Agree/disagree	**C1 – Biosecurity**
	All agree
Needed/added	Quarantine officers have to be strict
	People have to work together in protecting the country
	Involving key stakeholders (customs/immigration/airport /marine key officials – capacity building in border control of targeted IAS)
	Some existing monitoring tools available at fisheries can be used to support the monitoring and surveillance of marine-related activities in the main port area
	Surveillance for Myna birds
Agree/disagree	**C2 – Management of established invasive**
	All agree
Needed/added	Funds, tools, and equipment should always be available
	To strengthen the programs for controlling invasive species
	To find the best way of controlling invasive species that suits our condition without harming other beneficial organisms
	Consider extending control of IAS that are present and impacting abandoned pulaka pits to encourage pulaka pit restoration, for example, Funafuti pulaka pits. However, such action can potentially eliminate IAS from these areas as their breeding grounds if possibly happening
Agree/disagree	**C3 – Restoration**
	All agree
Needed/added	To plant trees to protect against soil erosion
	Landowners to plant trees on their abandoned lands to make use of their lands
	To plant the Kanava trees as most of the kanava trees are dying because of the Kou leafworm
	Extend these restoration measures to marine and terrestrial (land) conservation areas on all islands of Tuvalu if appropriate and the need is there

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 islands region. PRISMSS brings together experts to provide support within the 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

PACIFIC INVASIVE SPECIES BATTLER RESOURCE BASE

The Battler Resource Base provides a central base for all invasive species information needs. It offers national invasive species practitioners and interested parties from around the Pacific an easier way to find information and knowledge products to assist with their programmes of work, research on priority species, and management of invasive species projects.

Nauti Primary School Students

SPREP PROE

Sustainable, transformative and resilient for a Blue Pacific