NATIONAL INVASIVE SPECIES STRATEGY AND ACTION PLAN 2014-2020






Invasive species are of significant threat to the environment, economy and livelihood of the people. This NISSAP has been developed to identify these invasive species and as a result identify and prioritise actions to address these threats.

Department of Environmental Protection and Conservation
Government of the Republic of Vanuatu

FOREWORD

Vanuatu places great importance on sustainable development to achieve the government's Vision, 2006-2015 "an educated, healthy and wealthy nation".

Invasive Species (IS) are introduced species that become destructive to the environment or human interests; they can also include some native species that increase in number and become destructive following environmental changes. They are one of the major threats to the native significant species of plants and animals of Vanuatu. In order to achieve the government's vision, the nation must conserve and/or manage Vanuatu's biodiversity from the devastating impacts of Invasive Species.

IS have significant impacts leading to declines in agricultural production and income, and damage to health & wellbeing. They play a significant role in the decline of native species and habitats. As an example of impacts on native biodiversity, the invasive Big lif vine (*Merremia peltata*) is seen as the number one killer of Vanuatu's primary forest. The little fire ant (*Wasmannia auropunctata*) was introduce to Vanua Lava in the Torba province and has spread to the neighbouring islands of Gaua & Motalava where it has affected the people's health and daily gardening activities. More recently it has been found near Luganville on the largest island of Vanuatu, Santo a biodiversity hotspot of Vanuatu and at the capital, Port Vila on Efate. There are many more examples that are further discussed in this strategy.

The current movement of people from one place to another, or from one country to another, and the increasing amount of development into our islands, act as pathways for species introduction to our islands, either intentionally or accidentally. Due to the increasing number of invasive species and their impacts on native plant, animal species and habitats, Vanuatu has accessed funds from GEF, through its implementing agency UNEP and technical support from SPREP and supporting partners, to develop its first ever National Invasive Species Strategy and Action Plan (NISSAP).

It is perceived, that unless Vanuatu has a national guiding document to guide activities and strategies to combat the impacts of IAS, the threats will continue to increase and a decline of biodiversity services will continue.

The NISSAP has been formulated through two provincial consultations and research work coordinated by Vanuatu's Department of Environmental Protection & Conservation GEF-PAS Invasive Species Project. The strategy sets out the actions that are required and delegates responsibilities to relevant government, NGO's and private sectors to implement them within the Strategy & Action Plan.

We look forward to the collaboration between the Vanuatu government relevant sectors, Provincial authorities, non-government organizations, church groups and local communities to implement the plans and actions to realise the goal and aims of Vanuatu's National Invasive Species Strategy and Action Plan 2014-2020.

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Secondly the DEPC Invasive Species Project team would like to extend its gratitude to the organizations and government departments who have contributed to the formulation of this document. In particular we would like to mention the following organisations:

- Biosecurity Vanuatu
- Farmers Support Association
- Fisheries Department
- Public Health Department
- Forestry Department
- TORBA Province
- SANMA Province
- PENAMA Province
- MALAMPA Province
- SHEFA Province
- TAFEA province
- SPC
- PII
- Ports & Marine Department

Thirdly we appreciate the contributions of those women and men who have shared their important invasive species experiences and their willingness to discuss the different issues learnt in their communities regarding biodiversity conservation during the two provincial consultation workshops.

And finally we acknowledge the valuable contribution of the DEPC staffs to the development of the NISSAP, and the National Invasive Species Technical Advisory Committee (NISTAC) team for their commitment to the project as the National Technical Advisory team supporting the project coordinator to implement project activities and the strategy formulation. They have each made great contributions to the project and deserve credit for their commitment

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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 the earth, including the variability within and between species and within and between ecosystems.

Biosafety: Minimising the risks from both the international and accidental introduction and spread of organisms with potential to have adverse economic, environmental and socio-economic impacts, including genetically modified organisms (GMO's). (Biosafety is effectively the same as biosecurity except that it also includes GMO's).

Biosecurity: Preventing the spread of invasive species across international or internal borders.

Control: Reducing the population of an invasive species.

Eradication: removal of the entire population of an invasive species.

Genetically modified organism: An organism whose genetic composition has been altered by the application of modern biotechnology techniques.

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 increase in number and become destructive following environmental changes.

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.

Risk assessment: Evaluation of the risk that a new introduced species will become invasive with damaging consequences, prior to its introduction

Surveillance: Monitoring to detect the arrival of new invasive species.

ACRONYMS

ACIAR	Australian Centre for International Agricultural Research
BV	Biosecurity Vanuatu
CABI	Commonwealth Agricultural Bureaux International
CBD	Convention on Biodiversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DARD	Department of Agriculture and Rural Development
DEPC	Department of Environmental Protection and Conservation, Vanuatu
EDRR	Early Detection and Rapid Response
ERP	Emergency Response Plan
FD	Forestry Department, Vanuatu
FiD	Fisheries Department, Vanuatu
GEF-PAS Inv	The Global Environment Facility Pacific Alliance for Sustainability. United Nations Environment Programme: Prevention, Control and Management of Invasive Alien Species in the Pacific Islands
GISD	Global Invasive Species Database (maintained by ISSG)
GISIN	Global Invasive Species Information Network
HPWRA	Hawai`i-Pacific Ecosystems at Risk
IBPoW	Island Biodiversity Programme of Work
IAS	Invasive Alien Species
IMO	International Maritime Organisation
IRD	Institut de recherche pour de developpement
IS	Invasive Species
ISSG	Invasive Species Specialist Group of the Species Survival Commission of the IUCN
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
LCIP	Landholders Conservation Initiative Project
LRD	Land Resources Division (of SPC)
MALFFB	Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity
NBSAP	National Biodiversity Strategy and Action Plan
NISC	National Invasive Species Committee
NISSAP	National Invasive Species Strategy and Action Plan
NISTAC	National Invasive Species Technical & Advisory Committee, Vanuatu
NIWA	National Institute of Water and Atmospheric Research, New Zealand
OIE	Office International des Epizooties
PestList (PLD)	Pacific Islands PestList Database
PIER	Pacific Island Ecosystems at Risk – for plant risk assessment information
PII	Pacific Invasives Initiative
PILN	Pacific Invasives Learning Network
PIP	Pacific Invasives Partnership
PIRNC	Pacific Islands Roundtable for Nature Conservation
Plant Pono	Hawai`i-Pacific Ecosystems at Risk website for plant risk assessment information
PoWPA	Programme of Work on Protected Areas
SPC	Secretariat of the Pacific Commission
SPREP	Secretariat of the Pacific Regional Environmental Programme
SSC	Species Survival Commission of IUCN
UNEP	United Nations Environment Programme
VNDMO	Vanuatu National Disaster Management Office

1.0. INTRODUCTION

1.1. Introduction to Vanuatu

Vanuatu is a Y-shaped archipelago located in the Southwest Pacific Ocean at 13-20°S, 166° – 172° E. There is a distance of roughly 1,300 km from northernmost island to the southernmost. The country's coastline extends for 2,528 km long and comprises over 80 islands with a total land area of 12,336 km^2, set within a 200-mile exclusive economic zone (EEZ) of approximately 680,000Km^2.

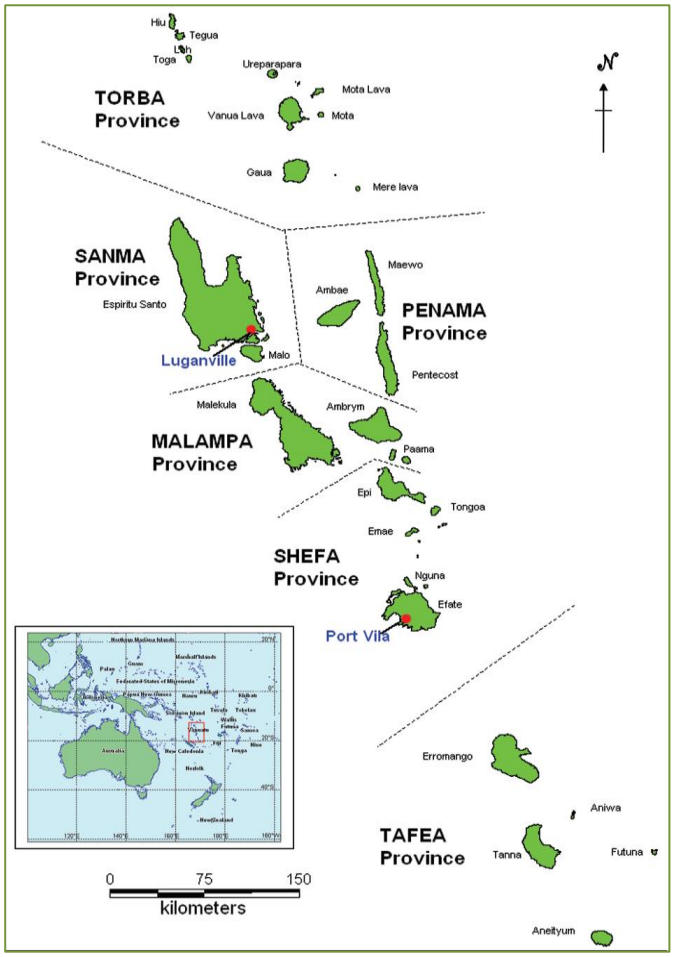

Figure 2: Map of the Vanuatu archipelago (*Map extracted from 2012 Statistics Pocket Booklet, VNSO*)

Vanuatu's islands are geologically young and were formed during the four main volcanic activity periods. The oldest islands are the Torres Group; this group of islands is part of the most northern province of TORBA. Santo the largest island in the SANMA province and Malekula, the larger island in the MALAMPA province, were formed over 22 million years ago. Pentecost and Maewo, islands are the PENAMA province are the second oldest, and were formed between 4 to 11 million years ago.

Futuna Island as the most eastern island in the TAFEA province situated in the south of Vanuatu and Mere Lava on the most northern province of Vanuatu, TORBA formed between 2 and 5 million years ago. The remaining islands were formed during the last 3 million years. The island building process is continuing and it is thought that about 20 percent of the Vanuatu land surface was formed in the last 200,000 years.

Vanuatu's climate can be defined by two main seasons, the cold (dry) season from May to October and the hot (wet/cyclone) season from November to April. Its position close to the equator however means that Vanuatu has a relatively uniform temperature throughout the year. The warmest month of the year being February and the coolest is August. In the coastal areas, daily temperatures average 26 °C in the hot season with an average maximum of 30°C and an average minimum of 24 °C. Extreme night-time minimum temperature in some coastal areas may reach 13°C.

Rainfall is generally higher in the hot season than in the cold season. The wettest month in Vanuatu is usually March and the driest month is August. During the wet season, rainfall is

particularly high on the windward side (southeast parts) of the bigger islands and scarce during the dry season especially on the leeward sides (northwest part). Rainfall is variable on the smaller islands depending on their location and size. Afternoon showers are still a common feature of the weather in Vanuatu.

Its geographic location in the Pacific means that Vanuatu is vulnerable to earthquakes, volcanic eruptions, subsequent tsunamis and tropical cyclones. The hot or wet season in Vanuatu, which is from November to April, is also known as the cyclone season. The area of Vanuatu (land and sea) receives about 2-3 cyclones in a cyclone season, and the greatest frequency is in January and February.

In 2013, the Vanuatu National Statistics Office estimated the population of Vanuatu to be 264,652 with a growth rate of 2.3% per annum. Vanuatu's principal domestic exports in 2011 and 2012 were copra, coconut oil and kava. The economy is based primarily on subsistence or small-scale agriculture, which provides a living for over 60% of the population. Fishing, offshore financial services and tourism (with 321,404 visitors in 2012, compared to 2011, which was 248, 868 visitors), are other mainstays of the economy. Vanuatu is also culturally diverse with over 110 language and cultural groups (*Vanuatu National Statistics Office, 2012*).

In general, Vanuatu's larger and older islands support both a greater diversity of terrestrial ecosystems, and a greater diversity of plants and animals (Taiki et al, 2002). Rapid speciation and sub-speciation are able to occur because of conditions such as the presence of bodies of water separating two islands, and rugged interiors that separate catchments and lowland habitats. Frequent disturbance due to the passage of tropical cyclones, earthquakes and volcanic activity also exerts a profound effect on the distribution and abundance of species, especially on smaller islands. There is also a significant variation with latitude, with species that occur at high altitudes in the tropical north occurring at much lower altitudes in the sub-tropical south. Consequently there is considerable variation in the distribution of species within and between islands. As a result, Vanuatu's biodiversity is of particular biological interest for its on-going processes of immigration, range extension and contraction, and sub-speciation (*VEU MSP, 2002*).

Vanuatu's flora is thought to be more closely allied with that of Solomon Islands (especially the northern- most regions of the country), with some elements from Fiji, and very few from Australia and New Caledonia (VEU MSP, 2003). However, there is considerable variation between different plant families. For instance, 59% of palm genera are shared with Fiji and a lower proportion affiliated with palms in Solomon Islands. Similarly the fauna demonstrates closer affinities with Solomon Islands. Internally there is a biogeographic divide with islands to the north of Efate demonstrating significant differences to the islands to the south. A secondary divide has been described between the islands of the Banks and Torres groups (*Tennant, W. J. 1992*).

Smaller islands often support quite dense populations, with a heavy use of land systems. With the exception of Tanna, human settlements on larger islands are concentrated on the coastal lowlands, with the rugged mountainous interiors used to a lesser extent. Consequently biodiversity is most at risk in lowland areas and small islands, but remains relatively intact in the high altitude forests of larger islands.

Vanuatu is listed as one of five (5) Oceanic countries important for their wealth of biodiversity. In comparison to these countries however, very little is known about Vanuatu's biodiversity prior to the year 2005. Only a few detailed studies, on few genera, and few studies of the biota of smaller or less accessible islands were carried out.

1.2. The significant threat of invasive species for Vanuatu

Invasive species currently have significant impacts on Vanuatu's economy, biodiversity, human health and culture.

The little fire ant has been described as 'perhaps the greatest ant species threat in the Pacific region' (*GISD 2014*). It was first detected in Vanuatu on Vanua Lava in the northern Banks Group in 1996 and has since spread to other islands in that group, and to Santo and Efate. These ants occupy gardens and homes in large numbers frequently stinging the residents, particularly young children, and affect crop growth and yield; may also blind domestic cats and dogs. They reduce the numbers of native insects, have led to reductions in reptile numbers, and contribute to the spread of plant diseases. They are already having an impact on tourists visiting the Banks Group and would have major economic impacts for the whole country if they reach the main areas favoured by tourists.

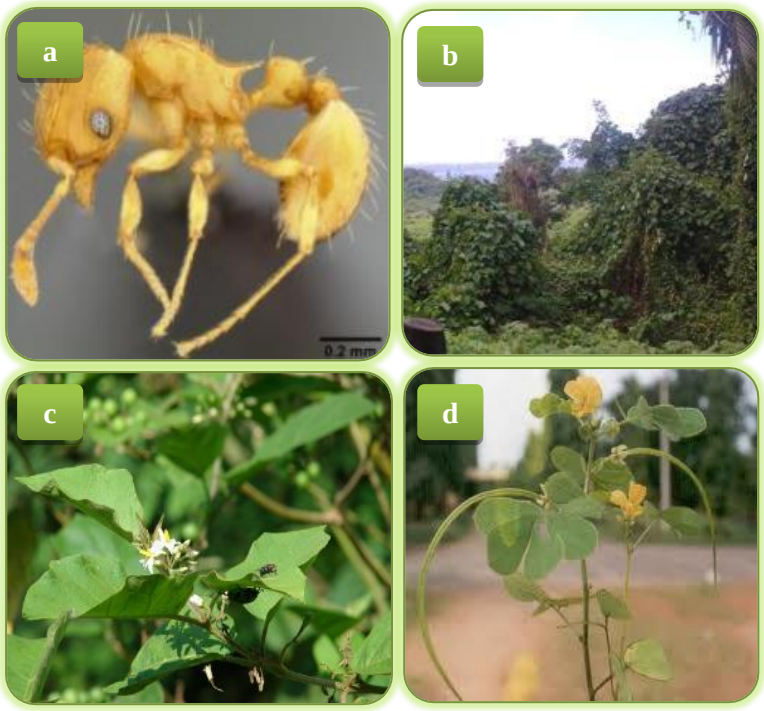

Figure 3: Invasive Species - (a) Little fire ant, (b) Big liv, (c) Wan dei rope and (d) wild peanut (piko).

Climbing vines particularly Big lif (*Merremia peltata*) and Wan dei rop (*Mikania micrantha*) create major problems for farmers to try to keep land open for gardens (plantations) and smother native forests. Scrubby weeds such as piko (*Solanum torvum*) and wild peanut (*Cassia tora*) can take over land cleared for cattle farming.

The big-headed ant *(Pheidole megacephala)* is a major threat to biodiversity through its impacts on native invertebrates, and to agriculture through harvesting seeds and increasing the numbers of crop-damaging sap-sucking insects. The yellow crazy ant (*Anoplolepis gracilipes*) has had to be controlled on Mystery Island to reduce the impact on tourists there.

The yellow-fever mosquito (*Aedes aegypti)* carries dengue fever and also the Zika fever virus not yet reported from Vanuatu but recorded in French Polynesia in 2013 and New Caledonia in 2014.

There are a significant number of invasive species, insects, fungi and diseases that affect agriculture causing significant losses and requiring additional work and costs (pesticides, etc.) for farmers. One example is the taro beetle (*Papuana uniondis*). Adult Taro beetles burrow into taro corms, damaging quality of the corms for consumption and for sale, and sometimes causing secondary rots to develop. Chemical controls have been developed but they are not currently available in Vanuatu. Instead farmers use cultural and physical methods include manipulating planting time, keeping taro gardens free of weeds, manipulating planting depth, mixed cropping including insect-repellent plants, planting new gardens further away from old gardens, and hand collecting adult beetles.

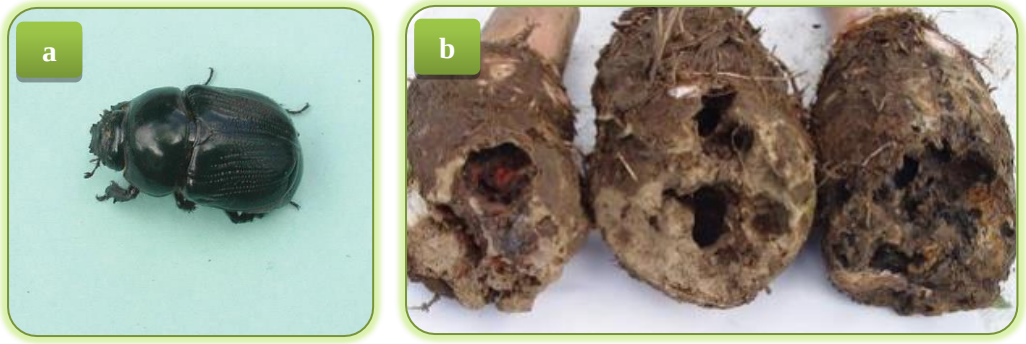

Figure 4: (a) Taro beetle and (b) taro beetle damage

Out of the twelve species of fruit flies present in Vanuatu, only three are known to attack cultivated economic fruit and vegetable crops. These includes *Bactrocera trilineola* (photo) which in the region is only found in Vanuatu where it occurs on all the islands and infests 95% of ripe guavas, 64% of ripe Malay apples and 11% of ripe mangos (SPC database); Bread fruit fly (*B. umbrosa*) which is also present in all the islands and *B. quadrisetosa* which is a minor pests of only Pacific lychee. The arrival of other species, e.g. Queensland fruit fly (*Bactrocera tryoni*) would be very damaging, e.g. halting Tahitian lime exports to NZ.

Figure 5: (a) Little fire ants on bait, (b) Yellow crazy ants on bait, (c) fruit fly (*Bactrocera trilineola*), (d) Giant African snail, and (e) Heliconia leaf attacked by leaf lap-lap rust fungus

The giant African snail (*Achatina fulica*) is an agricultural pest found on several islands. It eats a wide range of plant materials, fruits, and vegetables and is particularly damaging on cabbages. Very few farmers use chemicals for control and mostly pick snails by hand.

A recent arrival with a cultural impact is a rust fungus (*Puccinia heliconiae)* known locally as 'leaf lap-lap rust' that affects the leaves of Heliconia species commonly used to wrap and cook the traditional dish of laplap.

There is limited information available on pests of forestry. A brief survey was carried out in 2003 with the assistance of experts from ACIAR and a country review undertaken as part of a regional workshop (ACIAR 2003). The most obvious pest insects were various species of defoliating caterpillar which were found on plantations on Santo and fungi causing root rot were also observed.

Several introduced fish are threats to freshwater systems including native fish and prawns. Tilapia (*Oreochromis mossambicus)* has been introduced to Vanuatu for aquaculture, but in Palau there is a major effort to eradicate this species because of its invasiveness. There are less invasive genetic forms of Tilapia that should be considered as replacements for this species.

There is limited information on marine invasive species. The native crown-of–thorns starfish (*Acanthaster planci*) that feeds on corals undergoes periodic outbreaks in number that damage reefs. Recent underwater surveys by a team led by NIWA biosecurity of Star Wharf, Port Vila as part of an upgrade project, found and provisionally identified five species on the target list of potentially invasive non-natives. These were a barnacle (*Amphibalanus (Balanus) amphitrite*), and four bryozoans (*Amathia distans*, *Bugula neretina*, *Watersipora subtirquata*, and *Zoobotryon verticillatum*). These records await formal identification by specialist taxonomists. All five species are now relatively widespread in tropical waters. They cause nuisance fouling on ships, piers, buoys, and other man-made structures in marine environments. When they occur in large densities they can increase drag on vessel hulls, increasing operating and maintenance costs. They also can foul aquaculture facilities, increasing costs and stock mortality.

There are many examples from other island countries of invasive species that have had devastating and very costly consequences. The brown tree snake is thought to have caused the extinction of 10 native land-bird species on Guam leaving only two (Rodda & Savige 2007). The taro leaf blight reduced annual export returns for this crop in Samoa from around WS$10 million to c.WS$150,000 (US$60,000) over a couple of years (Hunter et al. 1998). The yellow-crazy ant present in Vanuatu, has killed an estimated 10-15 million of the famous red crabs on Christmas Island in the Indian Ocean in recent years (O'Dowd et al. 2003).

In 2004 the IUCN produced an updated publication of a selection of '100 of the World's Worst Invasive Species' (Lowe *et al*. 2004). Vanuatu already has at least 27[1] of the species on this list so there is a lot of work to do to tackle some of these where conservation gains are still possible. But there are a vast number more out there ready to invade if Vanuatu does not maintain strong border control.

[1] malaria, water hyacinth, African tulip tree, Brazilian pepper tree, cogon grass, Koster's curse, kudzu, lantana, leucaena, mile-a-minute, wedelia, big-headed ant, yellow crazy ant, snail-eating flatworm, Giant African snail, little fire ant, rosy wolf snail, sweet potato whitefly, Mozambique tilapia, western mosquitofish, Indian myna, feral cat, feral goat, mouse, feral pig, ship rat, rabbit.

Biosecurity Vanuatu has identified several major threats that are in neighbouring countries with which Vanuatu trades including the banana bunchy-top virus present in New Caledonia, cocoa pod borer in Papua New Guinea, and taro leaf blight currently in Papua New Guinea, Solomon Islands and Samoa. The banana bunchy top virus is transmitted by banana aphids (*Pentalonia*

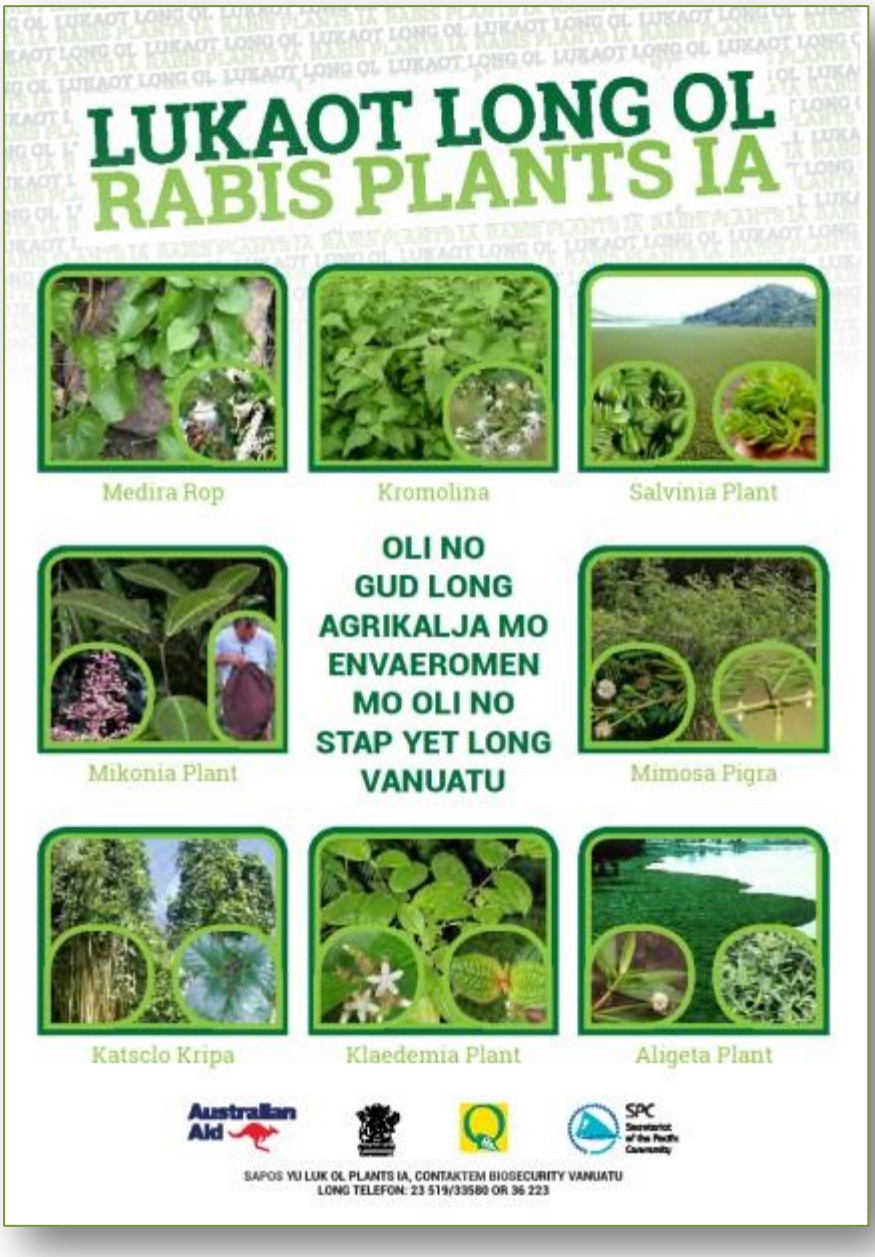

Figure 6: Biosecurity poster to alert people to serious weeds not yet in Vanuatu

nigronervosa) that also feed on *Heliconia.* BV has also prepared a recent poster (see below) that shows eight unwanted weed species that are some of the worst in the region outside of Vanuatu, including more climbing vines, waterweeds and species that invade pastures used for livestock. (Note: One species of Katsclo Kripa (cats claw creeper) is already present here but the one on this poster is a different, more damaging species).

There have also been some key interceptions at the border which shows how real the risk is of a serious new pest arriving. A Queensland fruit fly was hatched out and identified from an infected

fruit confiscated from a passenger at the airport and a cane toad (*Rhinella marina*) was found in a container at Port Vila.

1.3. Invasive Species - Everyone's Responsibility

The movements of people, and their goods and supplies, are the key ways that invasive species reach a country or move from island to island within it. So the behaviour of individual people, Ni Vanuatu and visitors is the key to their management. People need to avoid bringing risky goods into the country (fruit, plant material including seeds, soil (even on boots), etc.). If anyone sees a plant overseas that they would like to grow in Vanuatu, they need to identify it, then request an import permit through Biosecurity Vanuatu first. They will do a 'risk assessment' to decide if it is safe to bring in later. If people are importing a container of goods, or deck cargo such as a vehicle or timber, it needs to be checked very carefully when it reaches its destination and Biosecurity Vanuatu need to be alerted if any live animals/insects, or their eggs, are found. Individuals need to keep an eye out in villages, plantations and forest for any unusual animals or plants, for trees with leaves being eaten or dying over large areas. They may be the first to spot the arrival of a new plant disease or insect pest. Detecting it early is the key to eradicating it and potentially saving Vanuatu millions of dollars.

As an example, a phone call from a member of the public alerted Biosecurity Vanuatu to a beetle that was eating a coastal plant (of Convolvulaceae family) in Port Vila. This was a new invasive species for Vanuatu, *Aspidomorpha deusta* (see photo), but unfortunately it was already to widespread to eradicate. Some initial spraying was carried out but it is now found over a large area from along the coastline from Devil's Point to Pango. If it spreads inland it would be a threat to sweet potato crops.

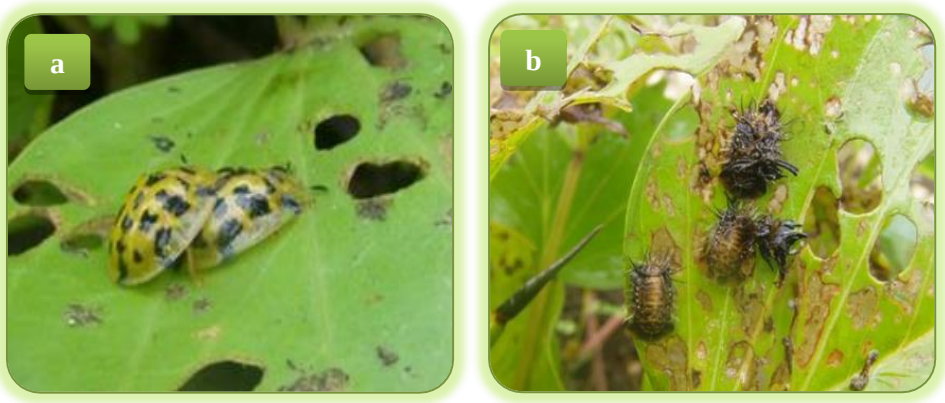

Figure 7: (a) Adult beetles (*Aspidormorpha deusta*), and

(b) larvae destroying leaves; and their discarded 'skins'.

A key part of this strategy will to try to prevent invasive species moving between different islands within the country. It is too late to eradicate many from Vanuatu altogether but we can maybe keep some islands free of them.

Invasive species are clearly also an international issue with an emphasis on preventing them moving from one country to another. So there are a number of international and regional organisations undertaking coordinating roles, a number of international regulations in force, and countries that trade with each other work in close cooperation.

1.4. Vanuatu's biodiversity at risk

Vanuatu has 65 endemic species, i.e. found only here, that have been assessed for their conservation status within the IUCN Red List of Endangered Species. This includes 12 bird species

one of which, the Tanna Ground dove (*Ptilinopus tannensis*), is considered extinct, and five of which are considered 'vulnerable': the mountain starling (*Aplonis santovestris*), palm lorikeet (*Charmosyna palmarum*), Royal parrotfinch (*Erythrura regia*), imperial pigeon (*Ducula bakeri*) and Vanuatu megapode (*Megapodius layardi*). Considering mammals, the Banks flying fox (*Pteropus funculatus*) is 'endangered' and the Vanuatu flying fox (*P. anetianus*) 'vulnerable'. Of nine endemic reptiles the Anatom emo skink (*Emoia aneityumensis*) (found only on Aneityum) is endangered and the common emo skink (*E. erronam*) (found only on Futuna and Aniwa) is vulnerable. One endemic land snail *Partula milleri* is critically endangered and another *P. eurania* is endangered.

These endemic species are threatened by extinction by a variety of factors of which invasive species are likely to be one of the most important. Rats, particularly the ship or black rat (*Rattus rattus*) which is a very good climber, are known to prey on the eggs and chicks of many birds and take lizards. They are implicated in the extinction of the Tanna ground dove. Big lif and other weeds damage the forest habitats in which most of these species live, and rats and mice (*Mus musculus*) eat the fruits and seeds of trees and alter the composition of the forest. Native partulid land snails have been wiped out in several countries by the rosy wolf-snail (*Euglandina rosea*). Lizards are a favourite food of feral cats though this is not an issue for the two threatened skinks as they live up trees, but they will be vulnerable to rats. Yellow crazy ants have been recorded killing crabs, lizards and nestling birds and can change the forest structure leading to declines in other native species.

Important ecosystems occupied by a range of species can also be threatened by invasive species. For example, Vatthe Conservation Area covers 2720ha of Big Bay, on the Island of Espiritu Santo and is Vanuatu's biodiversity hot spot. It is the most significant area of extensive alluvial and limestone forest left in Vanuatu. It provides habitat for a diversity of wildlife, including six of Vanuatu's nine endemic bird species, one globally endangered species, the Santa Cruz Ground Dove, (*Gallicolumba santaecrusis*) and three vulnerable endemic bird species, the Vanuatu Megapode, Royal parrotfinch, Chestnut bellied kingfisher, (*Todiramphus farquahari*), as well as three of Vanuatu's six endemic skinks and three endemic fish. The Conservation area hosts many culturally significant tabu sites for the communities nearby. The people from Matantas and Sara depend on this area in their daily activities for housing materials, custom medicines, and food. Their income generating activities include tourism, Bean tree seed harvesting and copra production. However this massive primary forest is now threatened by Big lif which is smothering and killing the native trees. The Teouma River is also a critical ecosystem that is also threatened by water hyacinth which covers a large surface area of the river. However the losses that water hyacinth may have caused is still yet to be confirmed.

Many communities have concerns about the impact of crown of thorn starfish on reef habitats in the country. This species is considered native to Vanuatu but it can occasionally become invasive and build up in large numbers, usually if the reefs are under stress from pollution or the impacts of natural disasters such as cyclones and tsunamis. Some parts of the country are experiencing an unusual outbreak lasting several seasons.

1.5. Why a NISSAP is needed?

Invasive species are an ever-present and growing threat and their management involves many different organisations from Government Departments, NGO's, Provincial Government, farmers, foresters, fishermen and women, and local communities. This management effort has in the past been fragmented and under-resourced and the NISSAP seeks to address this by bringing all stakeholders together around an agreed plan of priority actions.

Invasive species management has concentrated on plant and animal pests of the productive sector in the past, but there has been a growing recognition of their impacts on native biodiversity and the environment as a whole. This recognition has led to increasing efforts from environmental agencies, taking more of a coordination role addressing all invasive species, and to the development of a regional programme. Production of the NISSAP is an activity within that programme: the GEF-PAS regional invasive species project '*Prevention, control and management of invasive alien species in the Pacific Islands'* being implemented by UNEP with SPREP as the executing agency.

The 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 Management Action.

Implementation of the NISSAP should ensure that Vanuatu meets the Aichi target 9, established under the Convention of Biological Diversity: that *by 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled, and measures are in place to manage pathways to prevent their introduction and establishment.*

1.6. Process of NISSAP development

A strategy outline was sent to members of the National Invasive Species Technical Advisory Committee (NISTAC) and individual meetings held with DEPC, BV and Live & Learn during a brief visit by the international consultant in April 2014. Two provincial workshops were held then, jointly organised by the DEPC and Live & Learn. One in Port Vila, Efate on 14 April 2014 covered SHEFA and TAFEA Provinces and one in Luganville, Santo on 18 April 2014 covered SANMA, MALAMPA, PENAMA and TORBA Provinces. Invitees included Provincial Area Secretaries and Planners, members of Government Departments and the NISTAC (see Annex 3). These workshops discussed which priority invasive species required action, and how inter-island biosecurity and awareness raising and capacity building could be organised.

A draft NISSAP was circulated on 28 April 2014 and a final workshop held in Port Vila for key agencies on 6th May 2014 (see Annex 3 for attendees). A further draft was then circulated on 11 May and a final one developed, reviewed by the DEPC and approved by the Development Committee of Officials (DCO) and endorsed by the council of Ministers as a national policy.

1.7. 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 fed into this strategies and plans when they are next revised.

1.7.1. National Strategies

Vanuatu has a strong framework of national strategies and policies in place and all show that environmental issues are mainstreamed across different sectors and invasive species are widely mentioned. The detailed provisions in the NISSAP should be carried forward into the process of revising these different documents.

❖ Vanuatu Priorities and Action Agenda 2006 – 2015

The country's key national strategy is the Priorities and Action Agenda 2006 – 2015 (PAA) subtitled "An Educated, Healthy and Wealthy Vanuatu" (Government of Vanuatu. 2006). Its main agendas for action include growing the productive sector, especially agriculture and tourism, maintaining macroeconomic balance, raising public service performance, cutting costs associated with transport and utilities, and improving access to basic services such as health and education. 'Ensuring environmental sustainability' is identified as one of the eight Millennium Development Goals and environmental protection does feature within one of the seven strategic priorities together with primary sector development as:

1. Promote sound and sustainable environmental management practices;
2. Ensure sustainable management and conservation of Vanuatu's biodiversity;

The PAA notes that: *'Vanuatu's biodiversity is threatened by a number of introduced species of plants and animals and over harvesting of some reef and lagoon fish. However, quarantine protocols have been developed to prevent the import of weeds, pests and diseases. As a result, Vanuatu is largely free of animal diseases and parasites, which has allowed the cattle industry to flourish.'*

The process to develop a National Sustainable Development Strategy (NSDS) to follow the PAA has already started, coordinated by the Prime Minister's Office, and staff from different Departments including DEPC attended an initial consultation in Mele Village in 2013. 'Environment' is expected to be one of the 'pillars' in the NSDS with invasive species given some emphasis. The priorities identified in the NISSAP should be able to be carried forward, together with a set of quantifiable indicators through an Environment Thematic Working Group established as part of this process.

❖ National Biodiversity Strategy & Action Plan (NBSAP)

Vanuatu is currently preparing a revised National Biodiversity Strategy & Action Plan (NBSAP) to update the first one published in 1999 and workshops were held alongside the NISSAP ones to obtain provincial input into this. The actions identified in the NISSAP will be able to be fed directly into the NBSAP.

❖ National Biosafety Framework

BV and the DEPC developed this framework in 2005 following development of the international Cartagena Protocol (see section 6.2). It adds measures regarding genetically modified organisms (GMO's) to those for invasive species in general (Department of Vanuatu Quarantine & Inspection Services. 2005). It includes the following within biosafety management all of which are part of IS management:

- Risk analysis
- Control over the introduction, release and establishment of new species
- Border control, surveillance and emergency response for the exclusion and eradication of unwanted organisms
- Information, education and awareness raising

Relevant desired outcomes from the Framework, i.e. those covering invasive species, are incorporated in this NISSAP.

The Framework includes detailed guidelines and forms for risk assessment of new organisms that are applied to invasive species by QV. Production of the framework was an output of an internationally-funded project that has since come to an end. Some of its recommendations have therefore been included in the action plan in this strategy.

1.7.2. Sectoral Strategies

The PAA establishes a framework of sectoral policies/strategies and corporate plans.

❖ National Environment Policy (2013 draft)

This policy aims to create a framework that links already existing environment-related policies, while at the same time providing a roadmap for Vanuatu's long-term environmental objectives and actions. Furthermore…it will also serve as a strategic guide for the DEPC, enabling the improvement of existing governance, coordination mechanisms, and service delivery.

The policy has actions directly related to IS management including:

1. *Strengthen national capacity to adopt and implement animal health and biosecurity measures, including monitoring, detecting and reporting diseases and preventative measures against new pathogens or invasive species* (within a policy goal on biodiversity conservation)
2. *Develop a National Invasive Species Strategy to manage, control and eradicate harmful invasive species and streamline responsibility for invasive species awareness, currently undertaken by multiple agencies and sub agencies* (within a policy goal on strategic frameworks).

❖ Overarching Productive Sector Policy 2012-17 (draft)

This policy covers the productive sectors of agriculture, forestry and fisheries, which have been identified as priority areas for economic development. It recognises the major role played by traditional farming systems in livelihoods and food security and the importance of social and gender equity, environmental sustainability and the need to build resilience in a rapidly changing world. It identifies that to increase agricultural productivity more attention needs to be focused on pest and weed control and disease management, among other issues. One of its strategies is to improve the delivery of extension services to small farmers and this should provide an opportunity to disseminate more invasive species information.

A supporting policy statement reads: *Government will ensure a well-functioning biosecurity service to ensure adequate protection of Vanuatu's plant and animal health status from introduced exotic pests and diseases and to facilitate the export of agricultural products.*

❖ Vanuatu Forest Policy 2013-2023

This policy has the vision: '*Trees and forests of Vanuatu are equitably, sustainably and profitably managed and conserved, contributing to development for the ongoing well-being of all people in Vanuatu in the context of global change'*.

It addresses invasive species with objectives to: '*control the import of any foreign organism to prevent invasive species and the introduction of pests and diseases'* and to '*develop and implement a plan to protect against, control and eradicate invasive forest species*'.

It also contains an objective for deforested areas to be rehabilitated and reforested and control of *Merremia* is likely to be a prerequisite for this at many sites.

❖ National Environment Management Strategy

This strategy is being developed by DEPC to give effect to the National Environment Policy and implement its priorities.

1.7.3. Corporate Plans

❖ DEPC Strategic Plan 2014 to 2024

This plan has the vision of 'Leading Vanuatu to a clean, resilient and sustainable environment'. A key action within a 'Building Partnerships & Networking objective' is to: '*establish DEPC presence in each province'* which would be a significant development to assist in inter-island biosecurity, a key issue identified in this NISSAP.

❖ Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity (MALFFB)

The MALFFB's corporate plan identifies that the agriculture, forestry and fishing sectors account for around 15% of total GDP and for almost all merchandise exports. The Ministry is enthusiastic to see the nation's agricultural, forestry and aquatic resources are sustainable and managed efficiently, and that these resources make a significant contribution to the country's economic growth and wellbeing of the people. Within agriculture it identifies that Vanuatu has a favourable animal health status with no significant production limiting diseases for cattle and freedom from most OIE-listed diseases. Vanuatu possesses soils and climate that are conducive to timber production. The challenges for this sector will include ensuring replanting of trees at a rate at least equal to the volume being harvested; to foster the utilization of additional species; and to develop additional value-added processing. The fisheries sector comprises the oceanic and coastal fisheries resources which are exploited at the subsistence, artisanal and industrial levels and most of the catch is for home consumption or family distribution,

❖ Biosecurity Vanuatu

Within the BV section of plan are actions in border control and preparedness, plant health and animal health. Taking border control for example, it identifies the establishment of new outposts at Sola, Litzlitz, and Aneityum, the filling of all vacant border control positions and conducting training for Border control staff as necessary actions – all of which are included in the Action Plan of the NISSAP (section 8).

2.0 GUIDING PRINCIPLES

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. It should also be assumed based on international experience that any species imported only be kept in ponds, pens or cages will eventually escape into the wild.

Preventing the arrival of introduced species is more effective and cheaper than trying to manage them when after they arrive. So an emphasis should be placed on effective border control.

Eradication is more effective and cheaper in the long run than permanent control of an invasive species so should be attempted where feasible. Eradication is most effective if a new arrival is detected early while in small numbers, so surveillance and early warning systems are important. 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.

Species that cannot feasibly be eradicated should be considered for ongoing control, particularly biological control. This control may be aimed at keeping them out of important sites for native flora and fauna, e.g. protected areas, or restricting them to very low numbers there.

3.0 GOAL, THEMES & OUTCOMES

3.1. Goal:

"Yumi ol man Vanuatu I mas wok tugeta blong lukaotem gud envaeromen blong yumi long ol rabis sik blong ol animol mo ol plant, ol rabis kras,wud,rop mo ol anamol we i stap afektem life blo yumi mo hem ya we i no stap yet long Vanuatu blong mekem se yumi save stap gud".

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

Within the goal, emphasis is to be placed on:

- Maintaining the current status of native biodiversity
- Maintaining strong border control
- Developing inter-island biosecurity programme
- Eradicating species where this is feasible
- Controlling those species that cannot be eradicated.

3.2. Themes:

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

Theme A: Foundations

Managing invasives 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
- Legislative framework – appropriate laws, regulations, policies, protocols and procedures.

Theme B: Problem definition, prioritisation and decision-making

There are a large number of invasive species present in Vanuatu and many more outside its borders, and resources to tackle them are always limited. There needs to be systems in place to make decisions on 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, and finally any restoration work needed on sites where they have been removed.

3.3. Outcomes:

Outcomes are derived from the GEF-PAS Regional Invasives Project Document which in turn is based on the guidelines.

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

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

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

4.0 PATHWAY IDENTIFICATION

ISSG has compiled a spreadsheet, supplied to DEPC together with its review (ISSG 2014), that identifies the detailed means that the different IS present in Vanuatu move around. As an example, soil is a medium that can transport weed seeds, the nests of ants, the eggs of African land snail 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.

4.1. International

4.1.1. By Air

Six international airlines provide direct flights to Port Vila from Australia (Sydney, Melbourne and Brisbane), New Zealand (Auckland), Fiji (Nadi), Solomon Islands (Honiara) and New Caledonia (Noumea). There are also direct flights from Sydney and Brisbane to the airport at Luganville on Santo. There are discussions about the development of a new airport and direct flights from Asia which would represent a significantly increased biosecurity risk.

4.1.2. By Sea

❖ Commercial shipping

Figure 8: Container vessel, Luganville Port, Santo.

Two ports, Port Vila and Luganville, handle container shipping and are served by several international shipping companies. The outsides of containers can harbour invasive species in addition to their contents. The keys to blocking this pathway are good procedures when filling containers and preparing manifests (lists of contents) at the country of origin and inspecting and fumigating as many as possible on arrival in Vanuatu. Some goods and machinery may be shipped as deck cargo and pose a particular risk. One damaging example that could arrive in containers or used machinery is the Asian honey bee (*Apis cerana*).

❖ Visiting Yachts

There are five designated Ports of Entry for visiting yachts to obtain customs clearance to enter Vanuatu: Port Vila (Efate Island), Luganville (Santo), Lenakel (Tanna), Sola (Vanua Lava) and Analgawat (Aneityum). Only the first three currently have biosecurity officers stationed there and at the other two biosecurity responsibilities are covered by an Agricultural Extension Officer (at Sola) and a policeman (at Analgawat). It is proposed to appoint biosecurity officers at Sola and

Analgawat in 2015. There are concerns that some yachts visit some islands before obtaining cuctoms clearance at one of the main islands. One example is the Torres Islands, the first group encountered if sailing from the north where yachts may spend time before clearing at Sola, which represents a biosecurity risk.

❖ Cruise ships

Vanuatu is visited by cruise ships originating mostly in Australia or New Zealand, with smaller numbers from Hawaii or French Polynesia. The majority are from Australia and visit New Caledonia, or New Caledonia and Fiji, en route before Vanuatu, though a small number sail via Papua New Guinea and Solomon Islands. Ships from Hawaii travel via American Samoa, Samoa and Fiji, and those from French Polynesia via Cook Islands, American Samoa and Fiji. So cruise ships can theoretically carry invasive species from several neighbouring island countries to Vanuatu.

4.1.3. Other External Pathways

❖ Natural disasters

Natural disasters such as cyclones may directly carry new invasive species to Vanuatu, but their major threat is an indirect one through the consequent relief operation. Large amounts of supplies and relief materials are likely to enter the country over a short period from a variety of different countries, at a time that border control facilities and procedures have broken down. While humanitarian needs are obviously the priority, disaster management planning needs to emphasise biosecurity to avoid the recovering population being also faced with a long-term threat to their economy or environment. There may be a need to bring in overseas biodiversity personal to assist local staff manage the increased traffic, potentially including high risk items, at a time they may also be looking after family crises.

A supplementary developed alongside the PAA on Mainstreaming Disaster Risk Reduction and Disaster Management (2006) does not address issues related to biosecurity. Nor does the Disaster Risk Reduction and Disaster Management National Action Plan (2006 - 2016). There is a need to include such issues in the next update to this plan.

❖ 'Natural' pathways

New organisms can also arrive in the ways that they have done so forever unaided by people; by flying to Vanuatu, being carried here on the wind, swimming here or 'rafting' here on floating vegetation. All people need to keep an eye out for any unusual species and assess any found for the risk they pose.

4.2. Internal Pathways

4.2.1. By Air

Air Vanuatu runs domestic flights on the routes shown in the figure below. It can be seen that Port Vila and Santo act as hubs with many flights connecting through them. There has been some tightening of the rules regarding passenger baggage carried on these flights, which is of a biosecurity benefit, such as goods wrapped in plant leaves no longer being accepted.

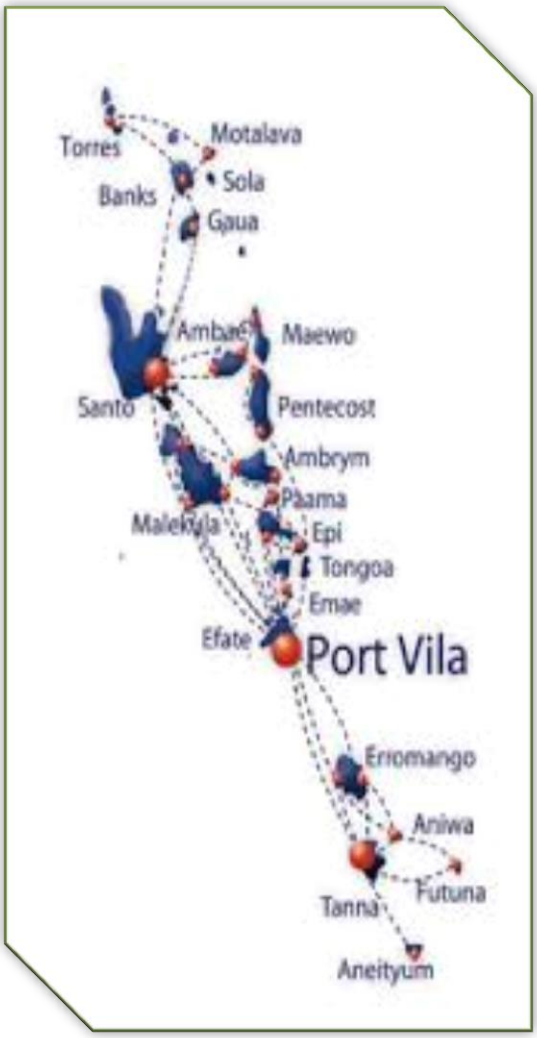

Figure 9: Air Vanuatu domestic flight routes. (*Air Vanuatu*)

4.2.2. By Sea

The two main ports of Port Vila (Efate) and Luganville (Santo) serve as the main entry points for cargo which is shipped from there to other parts of the country. Port Vila is the hub for the southern islands of Aneityum, Futuna, Tanna, Aniwa, Erromango and the central islands of Epi, Efate offshore islands, the Shepherd islands, Ambrym, Paama and Malekula. Luganville is the hub for the other islands. Most of the outer island have limited shipping infrastructure which means that cargo may be discharged from a freighter or ferry onto a smaller boat to be taken ashore. Minimising the movement of invasive species through internal shipping is a challenge to be tackled in a proposed inter-island biosecurity programme.

Boats carrying logs or livestock may carry particular risks and fishing boats also move between different islands unloading their catch.

4.2.3. 'Natural' pathways

These pathways are equally involved in the inter-island spread of invasive species. Birds can fly from one island to another, some flying insects or fungal spores can be moved by the wind and other small pests carried on rafts of floating vegetation.

5.0 ROLES & RESPONSIBILITIES

This section identifies the roles of the different agencies and organisations who are stakeholders in IAS management.

5.1. National

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❖ Biosecurity Vanuatu (BV) – formerly Vanuatu Quarantine & Inspection Services

BV is the National Biosafety Focal Point and the Competent National Authority for ensuring national biosafety which includes biosecurity. It is mandated to protect the borders from incursions of pests and diseases into Vanuatu as well as manage pests and diseases already present. It does this through ensuring that risks posed by imports to local plants and animals are managed at an acceptable level and through disease surveillance and control programs for pests and diseases already present in the country. In addition BV facilitates market access through assurance of pest and disease freedom and food safety. The department also ensures that Vanuatu maintains its obligations to such international organizations/conventions as IPPC and the OIE.

BV has five main divisions – administration, border control, plant health, animal health & veterinary services, and meat inspection.

❖ Department of Environmental Protection and Conservation (DEPC)

The DEPC is mandated by Environmental Protection and Management and Conservation Act No. 12 of 2002 Part 6 section 42 (2) (ii) allows the minister concern to regulate the environmental effects of the proposed introduction of foreign organisms and (iii) for pest and weeds.

Key roles in relation to IS are as follows:

- Coordination of IS programmes through its Biodiversity Division
- Coordinate and implement donor-funded IS projects
- Develop NISSAP, IS policies and legislation
- Capacity building and training for IS management
- Raising awareness of IS at community level.

The GEF-PAS is DEPC's first major multi-year invasive species project and this reflects an increased role being adopted by environment agencies worldwide. It will concentrate on coordination and monitoring/evaluation with limited on the ground activity, and will look to agencies like BV who have the capacity and expertise for this.

The Department has four divisions which biodiversity and conservation is one. The division has only one officer responsible for all conservation and biodiversity matters including invasive species. The department is currently revising its structure creating a position for the invasive species and biosafety officer for recruitment within the biodiversity and conservation division after the term of the GEF PAS IAS project.

❖ Department of Agriculture and Rural Development (DARD)

The DARD is mandated to establish appropriate policies and legislations to administer the agriculture sector and is currently developing a new national agriculture policy to be completed in 2015. DARD's 'goal' is to ensure that the nation's agricultural resources are managed to provide food and cash crops as well as environmental and social services to contribute profitably to income generation, employment opportunities, and social wellbeing for all people in Vanuatu, and thus to sustainable economic growth.

Pests and diseases pose a huge risk to the nation's agricultural resources and can cause substantial economic losses to our production outputs if they are not properly managed or controlled. DARD's technical and field extension officers have worked closely with Biosecurity Vanuatu, other line departments, and our development partners over the years to raise awareness and address production problems especially at farm level regarding the management of economic pests and diseases. The department through its collaborative networks has also supported a number of project initiatives to combat invasive species of plants and animals in the country.

The MALFFB corporate plan of 2014-2018 highlighted the need for some restructuring that should see the role of "Plant Protection", currently under Biosecurity Vanuatu, transferred to DARD under a new Plant Protection Unit.

❖ Department of Forestry

The Department has a mandate to manage forest resources through a National Forest Policy adopted in 1998. The national goal for the forest sector is to ensure the sustainable management of Vanuatu's forests to achieve greater social and economic benefits for current and future generations. This includes the management of pests and diseases though there is limited information or capacity in this area.

❖ Department of Fisheries

The Department of Fisheries has the responsibility for the management, development and conservation of all fisheries resources in accordance with the Fisheries Act CAP315 No.55 of 2005. Staff have the diving and marine survey skills necessary to undertake work on marine invasive species but no work is currently planned except for support to communities to manage crown of thorns. Overseas experts will be required to train staff in the identification of other IS.

❖ Live & Learn Vanuatu

Live & Learn Vanuatu started as an NGO in 2001 working on environmental issues and has expanded its services to include human rights, children-in-development and focuses on a range of priority programme areas including sustainable management of biodiversity, health, waste management, water and sanitation.

Live & Learn Vanuatu's philosophy is linking knowledge to change through education for sustainable development and making connections with relevant stakeholders and communities in Vanuatu. It strengthens community-based governance and mobilises communities. It also strengthens the capacity of its staff members to deliver quality work to its stakeholders.

Live & Learn Vanuatu funds its programs with support from the public, governments, the corporate sector and international development agencies. It received funding from the European Union in 2011 for a 4 year project entitled 'Testing and modelling preventative measures to limit the spread and ecological impact of invasive species in Small Islands Developing States (SIDS)'focussed on the climbing weed *Merremia Peltata* Big Lif. It contains several phases: Research & Assessment, Support for the Management of IS (developed of a management model, education and awareness), Legislation and Policies (NISSAP and information management system and database), and Control and Eradication of *Merremia*.

❖ Farmers Support Association (FSA)

The FSA is a well-established NGO formed in 1983 that provides support to farmers. It has a research arm, the Vanuatu Agricultural Research & Technical Centre, which works closely with the Agriculture Department and the Vanuatu Agriculture College, Santo to carry out research to address the needs expressed by farmers. Current research includes the trialling of different plant extracts as organic pesticides. Its invasive species work focuses on pests of agriculture. It provides hands-on training and information for farmers to manage different crops as well as more generally to improve soil fertility. It can play a key role in 'flagging' key invasives issues for farmers.

❖ Department of Customs and Inland Revenue

The Department of Customs and Inland Revenue (DCIR) operates under the Customs Act No. 7 of 2013 and draft Prohibited Import and Export Regulations (2014) that prohibit the import of animals and animal products and plants and plant products where covered by other legislation such as CITES and the Plant Protection Act. DCIR plays an important supporting role for border control and take responsibility for this in some ports where there is no BV presence. Their interventions depend on specific technical training received from other departments such as BV.

❖ Department of Ports & Harbour

The responsibilities of Ports & Harbour Department are largely derived from the Ports Act, CAP 26.It can carry out inspection of vessels at Ports of Entry (Port Vila, Luganville, Lenakel, Loltong, Sola, Anelcauhat, Litzlitz) and issues licenses to international and national vessels entering. The Act defines the role of the Harbourmaster who's powers include permitting the master of a vessel to discharge ballast, ashes, oil and ships' refuse at such places and in such manner as he may direct. However Vanuatu is yet to accede into the International Maritime Organization to be able to implement guidelines for minimizing the transfer of invasive aquatic species as biofouling (hull fouling) for recreational crafts**.** There is also the IMO Hull Fouling guideline 2011. Along with this there is also the Anti-Fouling Systems (AFS) Convention that Vanuatu is also a Party. Any quarantine (biosecurity) or customs issues identified during inspections of international vessels are referred to the relevant departments.

❖ Shefa Provincial Council

The Council is a member of NISTAC (below) through its governance role for Shefa Province which includes Efate where NISTAC is established. Provincial Councils in the other Provinces will also

have roles facilitating the involvement of their communities in IS work, particularly border control under a proposed inter-island biosecurity programme.

❖ National Invasive Species Technical & Advisory Committee

The National Invasive Species Technical and Advisory Committee (NISTAC) was formed in 2012 following the receipt of funding for three invasive species projects by the DEPC, BV and Live & Learn. It has the responsibility to draw up plans and strategies to address invasive species problems. Furthermore, the committee will ensure that the project's activities are implemented in accordance to the funds provided and within the respective time frames. NISTAC role is also to provide technical advice to the three projects so that the objectives are achieved.

It consists of representatives of the following agencies:

- ❖ Environment
- ❖ Agriculture
- ❖ Forestry
- ❖ Fisheries
- ❖ Customs & Inland Revenue
- ❖ Biosecurity Vanuatu
- ❖ Live & Learn
- ❖ Farmers Support Association
- ❖ Shefa Provincial Council.

❖ Wan Smol Bag (WSB)

WSB is a regionally renowned theatre group that has built significant capacity in community awareness raising for conservation and maintains a network of Vanua Tai Resource Monitors. This network was built from community-based turtle monitors who have been renamed to reflect a wider role across all natural resources, fostering environment stewardship through community based approaches. WSB is not currently active in invasive species management but it is hoped to engage them during the term of this strategy to produce a play on the subject. There will also be discussion about any role the Vanua Tai Monitors might play in the proposed inter-island biosecurity programme.

5.2. Regional

SPREP and SPC are the two key agencies to provide regional coordination and support for the management of invasive species with impacts on native biodiversity, and agricultural and fisheries sectors, respectively. SPC also supports border control programmes. Annex 1 provides further details of their roles and identifies other agencies and initiatives that support invasive species work in the region.

6.0 PAST & CURRENT PROGRAMMES

There are currently three multi-year programmes in place that form the basis of the NISTAC. The DEPC is managing the Vanuatu component of the Regional GEF-PAS Invasive Species project; BV runs the Invasive Weed Management Project; and Live & Learn run the 'Testing and modelling preventative measures to limit the spread and ecological impact of invasive species in Small Islands Developing States (SIDS)' project.

6.1. Border Control & Quarantine

The current programme run by BV can be summarised as follows:

- Border control at ports of entry (staff deployment detailed in section 3.1)
- Risk assessment for proposed new imports or species intercepted at the border – based in Port Vila
- Plant health – primarily the management of pests and diseases affecting plants used for agriculture. Activities include pest management trials, biocontrol of weeds, and awareness raising & education programmes
- Animal health – largely the surveillance & monitoring of pests and diseases affecting livestock, and also veterinary responses to sick animals. (Note: Tuberculosis and Brucellosis were eradicated in the 1990s so Vanuatu's cattle industry is one of the most disease-free.

6.2. Control of Pest Vertebrates

❖ Indian Myna - Sako

Myna birds are said to have been introduced to Vanuatu in the 1880s when a ship carrying caged birds to Fiji was wrecked at Lenakel on Tanna. They became well established on Tanna and spread northwards to the islands of Efate, Epi and Paama. They are currently on Santo, Malo and Aore (Bregulla, H. 1992) but are absent from most of the islands to the east. There has been no coordinated effort to manage this species. A 'killing competitions' in which different villages competed to kill the largest number of birds for a shield and travel prize was run as an awareness raising project on Tanna during Environment Week (2008) as part of the Landholders Conservation Initiatives Project (see later).

6.3. Control of Pest Invertebrates

❖ Little Fire Ant – Fire Anis

This species has been the subject of a control programme since its arrival in Vanua Lava in the Banks Group around 1994. It was first reported to Vanuatu Quarantine in 1998 and a survey that year found it had spread to several sites on that island. Very significant efforts were made to prevent the spread of the ants from the Banks Group. In 1999 measures were in place to inspect and spray at Santo airport all aircraft arriving from Sola airport on Vanua Lava; inspection of all sea vessels from all ports from the area of infestation; and the banning of all agricultural exports from the area of infestation. In 2002 the effort was extended with a grant from the New Zealand Government including production of information materials for Banks Group and Santo Island (the

key airport/port for the northern part of Vanuatu), a further survey and trials of poison baits. By then the species had spread to other islands Mota, Gaua and probably Ureparapara, and by 2004 it was also on Motalava.

Efforts to restrict the species to the Banks Group were not successful and in 2003 it was detected initially on the outskirts of Port Vila on Efate and more recently in part of the town, and by 2005 was found at Luganville on Santo. As of 2009, the little fire ant was not recorded on the Torres Group though there is no recent information to confirm whether this is still the situation.

The next steps proposed are surveys to delimit the infestations on Efate and Santo so that their containment or eradication can be considered.

❖ Giant African Snail

The giant African snail is thought to have arrived in the Pacific during World War 2 and has been present in Vanuatu for many years, though it is still not found on all the main islands. Past control efforts have included the unfortunate introduction of the rosy wolf snail (*Euglandina rosea*) though this proved an 'invasive species' itself, whose greatest impact was on native snails. In the 1990s the giant African snail spread to Tanna, Emae and Malakula and there have been some efforts at containment, e.g. the Plant Protection (Control of Quarantine Pest) Order No.20 of 1999. This Order was issued after consultation with the Director of the Vanuatu Inspection and Quarantine Serves and the Principal Plant Officer to control the movement of the quarantine pest *Achatina fulica* ("Giant African Snail") *from the area of infestation on the island of Tanna.* The flatworm (*Platydermis manokwarii*)[2] is present on many of the infested islands and achieves some measure of control. Efforts within the strategy will concentrate in preventing it reaching other islands e.g. Torba Province through the inter-island biosecurity programme.

ACIAR supported a programme on the control of taro beetle for several years in which the chemicals bifenthrine and confidor. However these are no longer available in Vanuatu after importing arrangements did not work out. Today farmers use a range of cultural and physical methods include manipulating planting time, frequent weeding, manipulating planting depth, mixed cropping including insect repellent plants, re-planting further away from old gardens, and hand collecting adult beetles.

6.4. Control of Pest Plants

There is a significant history of efforts to control pest plant or weeds on Vanuatu, typically with the support of SPC, using a range of manual techniques including herbicides, and more recently a comprehensive biological control programme led by BV. In the 1990s an overseas-funded livestock farming improvement programme focussed on the removal of many pasture weeds and promoted new grasses.

The climbing vine Big lif is currently the subject of significant activity with DEPC undertaking chemical-based control at Vatthe Conservation Area on northeast Santo and Live & Learn trialling physical control coupled with agroforestry on the islands of Tanna, Erromango and Santo.

[2] This species was first discovered on Papua New Guinea. Whether it is native to Vanuatu or was introduced accidentally or deliberately is uncertain.

❖ Biocontrol programme

A comprehensive biocontrol programme has been run by BV under the leadership of Sylverio Bule with support from SPC and other countries. A number of biocontrol organisms have been introduced to tackle priority weed species with the following results:

- Able to be effectively controlled: aquatic weeds: water hyacinth (*Eicchornia crassipes*) (see photos below) and water lettuce (*Pistia stratiotes*); terrestrial weeds: broom small leaf (*Sida acuta*)
- Subject to current programme: Wan dei rope (*Micrania micrantha*), cats claw creeper (*Macfadyena unguis-cati*), *Parthenium hysterophorus*, giant mimosa (*Mimosa diplotricha*), Lantana camara,
- Planned for future work: African tulip tree (GEF-PAS project); big lif, *Solanum torvum*, *Cassia tora*, *Hyptis capitata*, *Urena lobata*, *Amaranthus spinus*, Guinea grass (*Panicum maximum*), *Piper aduncum*, and *Sphagneticola trilobata* (proposal to ACIAR).

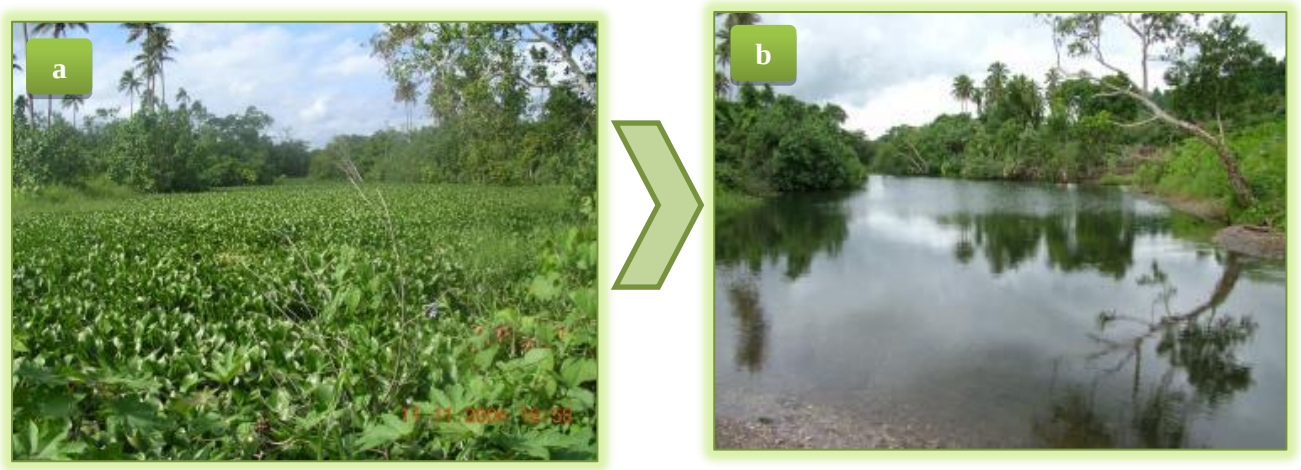

Figure 10: (a) Teouma stream infested with water hyacinth – 2004, (b) teouma stream after release of water hyacinth weevils - 2008

6.5. Control of marine invasives

There has not yet been any work conducted on any marine alien invasive species. The native crown of thorns starfish (COT) is however subject to periodic control by collecting individuals at various locations at various times when significant population increases or 'outbreaks' have occurred. Such outbreaks can be quite dramatic. As examples, in mid-2004 on Aore Island and the Million Dollar Point area on Santo over 3,000 COT were collected with funding from the NBSAP Add-on project, and in late 2013 shallow waters off Luganville, Santo yielded some 3.7 tons of COT during 9 days of community effort, both efforts supported by the Fisheries Department.

6.6. Education and awareness

All the key organisations involved in IS management have produced awareness materials, typically posters and fact sheets and run occasional radio programmes and made school visits. Biosecurity Vanuatu has produced posters and appeared frequently on radio to update the public on different

issues. It has also produced a module 'The Importance of Biosecurity in Vanuatu' for year 10 agriculture students and teachers.

6.7. Community-based activities

One example of these activities was the Landholders Conservation Initiatives Project, a 4-year GEF-funded Government initiative (2005-2009) with the objective of: greater and more effective application of local and culturally appropriate mechanisms to conserve Vanuatu's internationally significant biodiversity. It supported a portfolio of community based conservation activities on Gaua, Santo and Tanna islands. Two US Peace Corps volunteers worked in Tanna and Gaua and strengthened field capacity on invasive species. It produced awareness materials on invasive species.

Invasive species are common threats identified by local communities affecting their environment or biodiversity during the development of community conservation area management plans. Community action plans are established for invasive species control or eradication as part of management activities for the conservation areas. Examples include the Vatthe and Penoru conservation areas on Santo and their experiences of the Big lif vine.

7.0 LEGISLATION & INTERNATIONAL CONVENTIONS

The following Acts and Regulations include provisions relating to invasive species management:

7.1. National Legislation

❖ The Animal Importation and Quarantine Act No. 7 of 1988

Regulates the control of animal importation including the importation of animal products and biological products into Vanuatu and related matters. It is unlawful to import or introduce any animals into Vanuatu without first obtaining a permit granted in accordance with the provisions of the Act i.e. obtaining a permit from the Principle Veterinary Officer.

❖ Animal Importation and Quarantine Regulation Order No.14 of 1994

Subsidiary legislation procedures and forms for issuing provisional import permits, and quarantine procedure governing animal, animal products, biological products.

❖ Plant Protection Act No.14 of 1997

The Act provides for (amongst other things) the exclusion and effective management of plant pests.
The Act provides for a Principal Plant Protection Officer and sufficient Quarantine Officers. They are granted extensive powers to board any craft and enter, open and inspect any part of the craft and its contents.

This Act defines 'quarantine pest" to mean a plant pest known or suspected of being capable of causing significant harm to natural resources and which is either not yet present in Vanuatu, or is of limited distribution and subject to active control measures.

These three establish a permit based regime where any live animal or plant cannot enter Vanuatu without the appropriate permit being granted by the Principal Plant Officer or the Principal Veterinary Officer.

It is worth noting that the Principal Plant Officer has generous powers of search, inspection and destruction of suspected 'goods' that threaten native plants including the power to prohibit vessels from discharging their ballast into the harbour.

Generally, legislation establishing border control agencies contain minimum environmental safeguards. These safeguards are limited to the prevention of marine pollution through oil spills, and the control of animal and plant diseases and the prohibition of identified quarantine pests.

Prevention and detection is derived from statutory rights of subjecting all animal and plant imports to risk assessments by the Principal Veterinary Officer and the Principal Plant Protections Officer.

❖ Plant Protection (Control of Quarantine Pest) Order No.20 of 1999.

This Order was issued after consultation with the Director of the Vanuatu Inspection and Quarantine Serves and the Principal Plant Officer to control the movement of the quarantine pest *Achatina fulica* ("Giant African Snail") from the area of infestation on the island of Tanna.

❖ Environmental Protection and Conservation Act No. 12 of 2002

This act contains a provision that the Minister responsible for environment has the power to issue subsidiary legislation for the regulation of the environmental effects of introduced foreign organisms, pests and weeds

❖ Fisheries Act

Provides for the control, development and management of fisheries.

❖ Forestry Act 2001

This Act makes provision for the protection, development and sustainable management of forests and the regulation of the forestry industry in Vanuatu and includes 'protection of the forest environment' among its five main topics.

❖ Biosecurity Bill 2014 (Draft)

The purpose of this Act is to protect the health, environment and agriculture of the Republic of Vanuatu and to facilitate trade in its animal and plant products by –

(a) controlling those pests and diseases affecting plants and animals that are already present in Vanuatu;
(b) controlling the introduction and spread of new pests and diseases affecting plants and animals;
(c) providing for the safe import and export of animals and animal products and plants and plant products;
(d) facilitating cooperation in the prevention of the international movement of pests and diseases affecting plants and animals.

This Act is in addition to the other legislation above and does not derogate from it.

7.2. International Conventions & Agreements

❖ Convention on Biological Diversity (Ratified 1993)

This 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 Convention has established a series of Aichi Targets of which no. 9 reads: '*By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled, and measures are in place to manage pathways to prevent their introduction and establishment*.'

❖ International Plant Protection Convention (IPPC)

The IPPC is an international agreement on plant health developed in 1951 and overseen by the 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
- developing phytosanitary capacity for members to accomplish the preceding three objectives.

❖ 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 special 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.

❖ Cartagena Protocol on Biosafety

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

❖ International Convention for the Control and Management of Ships' Ballast Water and Sediments.

In 2004, the IMO adopted this Convention which will enter into force 12 months after it has been ratified by 30 states representing 35 percent of the world's merchant shipping tonnage. It will ensure the safe management of ballast water through requiring ships to have ballast management plans and detailed record keeping.

❖ Convention on International Trade in Endangered Species (CITES)

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

8.0 ACTION PLAN

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

Outcomes & Actions	Activities	Target	Means of Verification and Monitoring Frequency	Responsibility	Financing
GUIDELINES - THEMATIC AREA A: FOUNDATIONS					
A1.*Generating Support* **OUTCOME 1.1: The impacts of priority invasive species on biodiversity, economies, livelihoods and health, are widely understood and actions to manage and reduce them are supported.**					
Raise awareness and carry out outreach on the impacts of IAS on biodiversity, economy, health and cultural values	Produce DVD on invasive species & their impacts, and project activities Visit high schools on Efate to raise awareness of IS and their impacts Join with projects visiting other areas/islands to include IS in their awareness programmes Organise awareness material on IS for Environment Week Upgrade and update DEPC website	DVD Produced & circulated July 2016 Visit 3 high schools in Port Vila – 2nd quarter 2014, 1st ¼ 2015 & 2016 – and by request Organise visits as opportunities arise (e.g. with JICA funded volunteer project) IS information or activities included in Environment Week in June 2014, 2015, and 2016 Website updated 2nd ¼ 2014,	DVD and a record of its circulation Annual record of school visits Annual record of any such visits Copies of the information; photos of displays. Reviewed annually. Annual records of work	DEPC	GEF-PAS

	to include IAS information Organise media campaign Produce short biosecurity video for showing at airport terminals – Port Vila and Luganville	1st ¼ 2015 & 2016 Campaign in last ¼ each year including 1 talkback radio programme, 1 provincial radio programme, and newspaper articles Video produced and running periodically in 2016	done on website Annual report on campaign activities and copies of information produced. Video and a report on its use in 2016.		
Development of community-focussed education and awareness resources	Produce and distribute Community Flipchart with visual profiles of invasive species. Produce Farmer's Pocket Guide on invasive species in Vanuatu Produce Media Guide. Conduct awareness through radio programmes. Produce documentary DVD	Distribution undertaken 1st half of 2014 Production in 2nd half of 2014 Production in 2nd half of 2014 2-3 programmes a year Competed in 2014	Flipchart and record of its distribution. Pocket Guide and record of its distribution. Media Guide and record of its distribution. Annual record of programmes delivered DVD and record of its distribution	Live & Learn	Live & Learn, European Union
Development of education materials	Extend current module '*The Importance Of Biosecurity In Vanuatu*' for year 10 agriculture students and teachers to include all of IS management	Completed in 2015	Module completed & annual record of use by schools	DEPC, BV, NISTAC members, Curriculum Development Unit	(To be found – e.g. GEF Small Grant)

Development of awareness materials for wider public	Develop poster on economic impact of IS in Vanuatu – aimed at raising community awareness so individuals prioritise the issue. Develop Crown of Thorns awareness programme for Efate (media, posters, fact sheets etc) Develop poster: 'Watch out for these pests' to cover species threatening biodiversity not yet in Vanuatu – as weed one on p.?. Could include brown tree snake, cane toad, Indian mongoose, red imported fire ant etc.	2015-16 2014/15 2015-16	Poster & record of distribution Awareness material & record of distribution Poster & record of distribution	DEPC Shefa Tourism Office DEPC	GEF-PAS (Funds to be obtained) (Funds to be obtained)
	Commission Wan Smal Bag Theatre Group to produce a play/musical on invasive species for TV.	Develop play 2016 Fund timeslots on TV 2016	Play script and annual record of timeslots on TV	DEPC, BV,	(Funds to be obtained)
Develop material on marine invasive species of most threat to Vanuatu (how they might arise and how to identify them)	Prepare awareness material on priority species identified in review in outcome 2.1 (posters, radio programme, signs at ports). Distribute material to all involved in marine activities (ReefCheck, OceanWatch, tourism operators, Marine Protected Area committees, coastal communities)	Awareness material produced and distributed in 2015	Awareness material & record of distribution	Fisheries and DEPC	ADB-CTI, SPC

Develop island-specific materials as part of 'inter-island biosecurity' project	For inhabited islands, identify key invasive species found elsewhere in Vanuatu that are not yet present, prepare information about them and how to keep them out(posters, DVD's, local radio programmes). Utilise networks (Provincial Area Secretaries, women's Committees, Youth Council, Agriculture Extension Officers, farmers associations, etc. to circulate widely.	A plan developed for each major island identifying key species it needs to keep out. Awareness material prepared for each island on key species, how to prevent their arrival, how identify them and report possible sightings Material circulated widely. Timing is linked to GEF-6 project.	Plans written. Awareness material & record of distribution.	DEPC, BV, Agriculture, Forestry, Fisheries, SPREP	GEF-6
A2. *Building Capacity* **OUTCOME 1.2: The institutions, skills, infrastructure, technical support, information management, networks and exchanges required to manage invasive species effectively are developed.**					
Establish a Melanesian Invasive Species Council based on the Micronesian model	Have one representative from the GEF-PAS IAS Project attend the Micronesian Invasive Annual Council Meeting for fact-finding. Hire an expert to help to research RISC Model & facilitate negotiations with the MSG member countries Consultation with relevant	Visit made and report written Expert hired and report produced with recommendations on how to establish the MISC and what its role would be Consultations held and	Completed report. Completed report. Report on consultations	DEPC, MSG Secretariat Members	GEF-PAS

	government department stakeholders (NISTAC) & MSG representative. Present findings to the MSG Council meeting Set up MISC and begin operating	recommendations provided to MSG Council. MISC established, resourced and operating by 2016	 Minutes of MISC meetings		
Have IS issues considered by the Melanesian Spearhead Group[3]	Identify priority IS issues that need to be brought to the attention of and be supported by the MSG. Feed in these issues to the attention of the MSG's Environment & Climate Change Technical Advisory Committee (ECCTAC) Invite PILN to make a presentation to the ECCTAC	Issues identified on an ongoing basis and compiled ahead of ECCTAC meetings. Reports provided for, and considered by ECCTAC meetings by 2015	List of issues maintained. Minutes of ECCTAC meetings.	DEPC, BV, NISTAC, MSG Secretariat Members	GEF-PAS
A national invasive Species Coordinator is appointed and a multi-sector national invasive species committee is formed and operating with ongoing support from PILN.	Establish a position within DEPC for national coordination of IS activities following the end of the GEF-PAS regional invasives project (August 2016) Establish a national invasive species committee (NISC). This could be based on the NISTAC with a revised TOR and the addition of other agencies (e.g. Ports & Harbours) with a role in IS work.	Position established and filled by mid-2016 to allow overlap with GEF-PAS Coordinator Obtain agreement to modify NISTAC TOR to widen role to cover all IS work.	Position filled Minutes of NISC meetings, late 2015 onwards	DEPC, Public Service DEPC, NISTAC, Other Departments	GOVT GOVT

[3] The Melanesian Spearhead Group is an intergovernmental organization, composed of the four Melanesian states of Fiji, Papua New Guinea, Solomon Islands and Vanuatu, and the Kanak and Socialist National Liberation Front of New Caledonia. It has its own secretariat, based in Vanuatu that facilitates meetings and coordination amongst MSG members.

	Establish a PILN team to join the network supported by SPREP	Identify and recruit other parties involved with IS to join the committee Committee established in last ¼ 2015 and meeting at regular intervals and as required. PILN team formed in 2014 and SPREP informed of membership and contact details. Vanuatu team attending any PILN regional meetings	Confirmation to SPREP. Minutes of meetings	DEPC, BV, NISTAC, SPREP	Participating agencies, SPREP
Obtain necessary equipment to establish an operational capacity for IS management at DEPC	Obtain vehicle, digital camera and other field equipment Obtain microscope and lab supplies to store and identify specimens, or share BV facilities.	Obtain by 2015 if funds can be identified.	Equipment inventory	DEPC	(Funds to be obtained)
Ensure that biocontrol programme activities become part of the job description of the Plant Health position following the end of the current project (2015) and the 4-year ACIAR one that follows.[4]	Amend job description of Plant Health position	Amended job description and biocontrol programme maintained from 2009 onwards	Job description and reports of programme.	BV	GOVT

[4] The biocontrol programme is currently run by an individual not on the permanent staff.

Carry out mid-term review of NISSAP and develop the next strategy	Commission an independent review of the NISSAP in 2017. Develop a revised NISSAP for 2012-2030	Review completed in 2017 Process to develop new NISSAP undertaken in 2019	Review report received. Recommendations acted on.	DEPC, NISC	(To be obtained) (To be obtained)
Provide increased Government staffing to fully address IS management	Fill up the positions of the current structure of Biosecurity Vanuatu. This structures provides border control positions on Aneityum, Tanna, Malekula, Luganville and Sola Recruit staff to fill the DEPC positions in the 5 provinces without extension officers and assign them IS responsibilities Revise Fisheries Division structure to assign marine invasive species responsibilities	Govt to fund the posts in the current structure of Govt to fund the posts in the current structure of Biosecurity Vanuatu Staff recruited in 2016 according to the DEPC revised structure Assign invasive responsibilities to a staff person by 2015	Positions in place Positions in place Job description of position	BV, Public Service & Finance Department DEPC, Public Service & Finance Department Fisheries Division	GOVT GOVT GOVT
Training/capacity needs are identified and training programs for key invasives management issues are developed and implemented.	Agencies identify training requirements for their staff involved in IS work. Likely areas include species identification, control and monitoring techniques, and risk assessment.	Training provided for new staff and existing staff at appropriate intervals.	Record of training provided	DEPC, BV, Forestry, Agriculture, Fisheries, SPC, SPREP	Overseas Governments – bilateral agreements, SPC, SPREP

Develop training component of inter-island biosecurity programme.	Identify key agencies/individuals involved in 'border' control in each main island and the training they require. Provide training to address needs.	Training needs assessment completed – timing subject to GEF-6 Training provided – timing subject to GEF-6	Assessment report. Record of training provided	BV, DEPC, NISC BV, DEPC, NISC, SPREP, SPC	GEF-6
Provide training for Harbourmasters and other Ports and Harbour staff on identifying invasive species issues associated with shipping.	Develop a brief training programme with the assistance of experts on marine invasives. Deliver programme to appropriate staff.	Programme developed and delivered to staff at all ports of entry by 2016.	Training materials and report detailing the staff who received training.	DEPC, BV, Ports & Harbour, SPREP.	GEF-6
A3. *Legislation, Policy and Protocols* **OUTCOME 1.3: Appropriate legislation, policies, protocols and procedures are in place and operating, to underpin the effective management of invasive species.**					
Enact draft Biosecurity Bill	Finalise draft bill. Arrange translation Present to Cabinet Prepare and circulate information on new Act when passed	Biosecurity Act passed by Cabinet before end of September 2014	Biosecurity Act in place	BV, State Law Office, DEPC, Live & Learn	GEF-PAS, EU - Live & Learn
Amend Environmental Protection and Conservation Act to include additional regulations	Add powers regarding: • management of invasives already in country • regulation of importation of new organisms that are environmental risk	Amended Act becomes law in 2015.	Amendments in place in legislation	DEPC, State Law Office	GOVT

	Define and include the term 'invasive species' in the amendment				
Complete updating of regulations identified in Biosafety Framework	Review recommendations in Biosafety Framework (2006) and Legislative Review (2003) Identify and act on recommendations not yet addressed.	Necessary changes in different legislation identified by mid-2015 Amended legislation in place by 2017	Record of legislation	DEPC, BV, State Law Office	GOVT
Amend legislation (e.g. Ports Act) to address management of ballast water, ship cleaning and the use of anti-fouling paints in line with international conventions, to reduce risks from marine invasive species.	Review current legislation and seek advice from SPREP on model ballast water regulations. Develop amended legislation.	Amended legislation in place by 2016	Record of legislation	DEPC, Fisheries, Ports & Harbour, State Law Office, SPREP	GOVT
Develop island or province-based regulations to assist inter-island biosecurity programme	Review role of local legislation and discuss at island/provincial level Develop agreed regulations	Review report completed by 2016 Regulations in place and enforced by 2016	Record of legislation	SPC LRD Biosecurity, SPREP	GOVT, GEF-6

GUIDELINES - THEMATIC AREA B: PROBLEM DEFINITION, PRIORITISATION AND DECISION-MAKING

B1. *Baseline and Monitoring*

OUTCOME 2.1: Systems are in place to generate baseline information on the status and distribution of invasive species, detect changes, including range changes and emerging impacts.

Carry out surveys of all islands to identify full range	Plan survey to identify islands that can be covered, the expertise	Surveys completed in 2014/15 and data entered in database	Survey reports and database records	BV, DEPC, Forestry,	GEF=PAS

of priority IS present.	required, and the priority species or groups to be targeted. Carry out surveys and report on surveys,			Agriculture, Fisheries, SPC LRD Biosecurity and Plant Health	
On Malekula collect detailed information on numbers and distribution of Sako - Indian Myna –to determine control options to prevent them spreading from there to Ambrym and from there to most of the remaining islands.	Carry out specific surveys on Malekula to identify any options of management to reduce likelihood of spread to Ambrym	Surveys completed in 2014/15	Survey reports and database records and distribution map	DEPC, BV	GEF-PAS
Carry out surveys to delimit current little fire ant – Fire Anis infestations on Efate and Santo to determine the opportunities to eradicate these.	Carry out delimiting surveys on Santo and Efate, securing consultant expertise through SPREP Carry out assessment of feasibility of eradication at different sites	Surveys completed 2014. Assessment report completed 2014	Survey report. Feasibility assessment report.	BV, DEPC, SPREP	GEF=PAS
Weed surveys carried out on most islands as part of 4-year biocontrol project – existing species and new species targeted for control.	Surveys planned and carried out.	Surveys completed in 2015	Survey reports.	BV	ACIAR
Carry out surveys for marine invasives at major ports.	Develop funding proposal for surveys at Port Vila, Luganville, Surveys of secondary ports, as part of inter-island biosecurity programme	Surveys completed in 2015 Surveys completed in 2016	Survey reports Survey reports	SPREP, SPC, DEPC, Fisheries	GEF-PAS GEF-6

Develop a National user-friendly IS Information System & Database (to be housed at DEPC)	Agree system requirements and format, and linkages to current systems.[5] Develop system Input existing data	 Develop system by last ¼ 2014 Input data completed 2015	System working and species data sitting within it.	DEPC, Live & Learn	GEF-PAS
B2. *Prioritisation* **OUTCOME 2.2: Effective systems are established and implemented to assess risk and prioritise invasive species for management.**					
Maintain & enhance current risk assessment system	Carry out review to identify gaps in the current system, including assessment of the guidelines annexed to the Biosafety Framework. Establish a modified system and guidelines Develop system to assign management priorities to different invasive species	Review carried out 2014/15 Revised system established 2015 System established 2015	Review report Annual reports Annual reports	BV, DEPC, Fisheries, Agriculture, Forestry	GOVT (Funds to be obtained)
Carry out assessment of marine invasives most at risk of reaching Vanuatu and causing damaging impact	Recruit consultant to lead assessment. Carry out assessment.	 Assessment completed 2016	 Assessment report	Fisheries, DEPC, SPREP	(Funds to be obtained)
Review risks posed by Tilapia used for aquaculture on native freshwater systems	Agree a process to carry out this review. Undertake review and make recommendations for future management	Review carried out in 2015	Review report	DEPC, Fisheries, BV	(Funds to be obtained)

[5] Including Fisheries Department crown of thorns database

B3. *Research on Priorities* **OUTCOME 2.3: Knowledge is updated for priority invasives, including species biology and impacts, and development of effective management techniques.**					
Maintain strong links to regional and international organisations e.g. with biocontrol programmes to provide options for management of weeds in Vanuatu	Fully participate in Heads of Quarantine and Heads of Agriculture meetings coordinated by SPC. Fully participate in annual meetings of International Plant Protection Convention and International Standards for Phytosanitary Measures	Attend both regional meetings; Heads of Agriculture and Forestry (HOAF) meeting and the Pacific Plant Protection Organization (PPPO) meetings Attend meetings when organised.	Staff trip reports. Staff trip reports.	BV, DARD and Dept of Foresty. BV, DARD and Dept of Forestry.	GOVT SPC GOVT, convention secretariats
Review the Little Fire Ant programme from its outset to identify lessons learned that can be applied to future work on this species, and others.	Develop TOR for the review. Obtain resources and carry out review.	Review carried out in 2015	Review report	SPC LRD Biosecurity, Public Health	(to be obtained)
Hold a workshop to discuss management of *Merremia peltata* once regional study of its genetic origins is complete.	Invite those applying different techniques to report on their work. Provide agreed recommendations to landowners on ongoing *Merremia peltata* management.	Workshop held in 2015	Workshop minutes	EPC, Live & Learn, SPC, FSA, SPREP	Participating organisations

Undertake research on Crown of Thorns	Research carried out on priority aspects – potentially on control techniques, genetics, causes of outbreaks	Research programme organised and carried out by 2017	Research reports	Fisheries, Institut de recherche pour de developpement (IRD)	ADB-CTI , IRD
Review the likely implications of climate change on the distributions and impacts of invasive species	Carry out review of implications of changing temperature, rainfall patterns and frequency of storms on existing invasive species. Assess altered risk of new invasive species being established.	Review carried out by 2017	Review report	DEPC, BV, Fisheries, Forestry, Agriculture, Meteorology	(to be obtained from climate change project or GEF-6)
GUIDELINES - THEMATIC AREA C: MANAGEMENT ACTION					
C1. *Biosecurity* **OUTCOME 3.1: Mechanisms are established to prevent the spread of invasive species across international borders and between the provinces and main islands, quickly detect and respond to those that arrive.**					
Review Operational Procedures for Border Control. (Produced in 2000 and need updating)	Review procedures and update. Review risks of incursions due to yachts visiting other islands before ports of entry (e.g. Torres Group), and take any actions required.	Procedures reviewed in 2014 and updated in 2015. Review conducted in 2015 and procedures amended 2016 if needed..	Review report and amended procedures Review report and amended procedures	SPC LRD Biosecurity, Plant Health SPC, Biosecurity NZ, AQIS	(Funds to be obtained; GEF-6?) (Funds to be obtained)
Carry out surveillance at high-risk areas including international airports and ports	Define programme and identify target species – e.g. ants, fruit flies. Assign or recruit staff to allow this to be carried out at Port Vila and Luganville.	Surveillance programme in place from 2015 onwards	Surveillance conducted Trip reports	SPC LRD Biosecurity, Plant Health	(Funds to be obtained)

Revitalise fruit fly programme	Train Research, Extension and Quarantine officers in Standards and operation procedures in fruit fly surveillance and monitoring Identify high priority quarantine risk areas Install traps (modified with local materials) at high priority quarantine risk areas Develop a system that assist Vanuatu to identify and authenticate fruit fly species Review national emergency response plan for incursions of exotic fruit fly Conduct Fruit Fly training awareness workshop Review research fruit fly program	Programme revitalised in 2015. Training conducted, Traps installed, Surveillance and monitoring operating	Programme reports	SPC LRD Biosecurity, Plant Health	SPC GOVT
Enhance import permit system to streamline electronic processing, etc.	Conduct workshop training on Biosecurity Information Facility (BIF).	Workshop held in 2015	Workshop report	SPC LRD Biosecurity, Plant Health	SPC
Review the Biosecurity Emergency Response Plan to deal with an incursion of a regulated pest or disease and keep the plan under review	Hold a workshop to review generic ERP for regulatory pests	Workshop held in 2015	Workshop report	SPC LRD Biosecurity, Plant Health, BV, DEPC, Forestry, Agriculture	SPC

Carry out an emergence response simulation exercise (last was in 2006)	Carry out exercise Review outcomes and make necessary improvements Establish store of emergency response equipment	Exercise planned and conducted in 2015 Store of supplies established in 2015	Report on exercise. Inventory of equipment held	SPC LRD Biosecurity, Plant Health, BV, DEPC, Forestry, Agriculture	SPC (Funds to be obtained)
Include IS activities and funding for them within national GEF-5 project	Participate in discussions for development of GEF-5 'Ridge to Reef' project to incorporate IS management in protected area management	IS activities included within GEF-5 project document in 2015 IS activities carried out within project in 2015	Project Document Quarterly and annual project reports	DEPC, FAO, BV	GEF-5
Develop Inter-island biosecurity programme to prevent IS spread to new islands	Participate in development of a regional IS programme for GEF-6 funding centred on inter-island biosecurity. Carry out inter-island biosecurity project.	IS activities included within GEF-6 project document by 2016 Project carried out in 2016-17	Project document Quarterly and annual project reports	BV, DEPC, SPC LRD Biosecurity, Public Health, SPREP	GEF-6
Ensure that measures to prevent the arrival of new invasive species are included in disaster management planning	Participate in development of revised national disaster management plans (e.g. Disaster and Risk Reduction & Disaster Management National Action Plan (NAP) (2006-2016) to include enhanced border control response	Participate in NAP review in 2016	Revised NASP incorporates provisions for enhanced border control	VNDMO	GOVT
Ensure no spread of invasive species from piles or other fouled structures removed from Star Wharf by disposal at landfill not dumping at sea	Structures removed and disposed at landfill	Structures disposed of safely in 2014.	Disposal report	Ports & Harbour, DEPC	JICA

Ensure that EIA's and Environmental Management Plans for major infrastructure projects contain provisions for minimising spread of invasives.	Review EIA regulations and procedures. Review major project EIA's and EMP's to ensure invasives prevention is adequately addressed.	Provisions to prevent spread of invasives (e.g. cleaning of machinery) included in EIA's and EMP's for major projects	EIA's and Environmental Management Plans	DEPC	GOVT
Enforce current livestock regulations to prevent cattle spreading weed seeds between islands	Enforce regulation requiring cattle to be held in yards for period prior to transport to discharge any weed seeds.	Ensure enforcement from 2014 onwards	Livestock Division Reports	Livestock Division, BV	GOVT
Keep biosecurity programme under review to respond to any significant changes in risk, e.g. if direct flights from Asia are introduced.	Review pathways annually to identify significant changes. Respond to those changes by adjusting the border control programme	Review pathways annually from 2015	BV staff reports	BV, NISC	GOVT
C2. *Management of established invasives* **OUTCOME 3.2: The impacts of priority established invasive species are eliminated or reduced by eradicating or controlling the target species.**					
Control/eradicate fire ants at priority sites following surveys	Develop pest management plan Obtain resources and control or eradicate infestations at agreed sites	Pest management plan developed outlining control/eradication objectives and work plans. Control or eradication programmes carried out	Pest management plan. Annual monitoring of ant numbers Project reports	DEPC BV, SPC LRD Biosecurity, Plant Health, SPREP	GEF-PAS (and additional future funds to be obtained, GEF-6?)
Control myna to reduce range	Agree on a management response,	Control carried out on	Project reports	DEPC, BV,	(Funds to be

on Malakula if recommended following surveys	develop pest management plan, source necessary funding and carry out plan	Malakula from 2015 if agreed	Periodic monitoring of myna numbers	SPREP	obtained; GEF-6?)
Review and maintain current pest plan biocontrol programme	Review of biocontrol activities in Vanuatu Monitor the success or failure of each biocontrol agents Maintain programme to transfer successful biological control organisms to further weed infestations (e.g. water hyacinth, water lettuce).	Review carried out in 2015 including monitoring success of existing agents. Facilitate the spread of existing successful agents	Review report BV database	BV, SPC LRD Biosecurity, Plant Health, SPREP BV, DEPC	SPC GOVT GOVT
Trial new biocontrol for African tulip tree when available	Identify which species/variety of African tulip is present in Vanuatu Host testing in NZ (Landcare Research) Impact assessment Breeding up and release if satisfactory impact assessment SPC to assist coordinate regional resources and activities in biocontrol program	Research completed in 2016	GEF-PAS Project reports	BV, DEPC, Landcare Research, SPC LRD Biosecurity, Plant Health, SPREP	GEF-PAS
Develop biocontrol options for further priority weeds (as part of Melanesian sub-regional project)	Finalise work plan for 4-country project	Project starts in 2015	Project reports	BV, SPC LRD Biosecurity, Plant Health	ACIAR
Encourage and support the Aneityum community to	Advice and support provided to community to develop eradication	Eradication achieved by 2015	Staff reports	BV	GOVT

eradicate *Hyptis* brevipes currently found at one site on the island	programme.				
Include invasive species management in protected area management plans	Carry out a review of which invasive species are present in a protected area and which are at high risk of arriving there. Identify those posing a serious threat to native biodiversity. Include the management of these species in management plans.	Current program be maintained and extend to 2016	Protected area management plans.	DEPC	GOVT, GEF-6,
Control priority invasive species in protected areas as they are identified' which allows new species to be added to programmes in addition to the Merremia, pigs, cats and dogs identified	Continue programmes to control *Merremia peltata* at Vatthe and Loru, and extend to Penoru Control feral pigs at Vatthe Control feral dogs and cats at Penoru	Current programme maintained and extended in 2015.	Project reports.	DEPC, SPC LRD Biosecurity, Plant Health, SPREP	GEF-PAS; GEF-6
Complete development of a national protocol for responding to Crown of Thorns outbreaks	Develop protocol Respond to outbreaks according to protocol	Protocol developed by 2016	Protocol document	Fisheries, IRD, other Govt. Depts., tourism operators, communities.	ADB-CTI
Development of a IS Management Model for community management of *Merremia peltata*	Maintain work with management communities in three village-based Invasive Species Management Areas. Encourage them to sustain the effort beyond life of project. Spread management model to other countries where L&L operates if successful.	Model completed in 2014/15	Report on management model	Live & Learn, SPREP	Live & Learn, European Union

C3. *Restoration* OUTCOME 3.3: Following invasive species management the best methods are determined and implemented to facilitate effective restoration of native biodiversity or recovery of other values.					
Restore sites and biodiversity after invasive species management occurs.	Evaluate the need to re-plant areas in which weed control occurs and undertake as appropriate. Identify areas to be re-planted	Areas where weed control occurs is re-planted	Project reports	BV, DEPC, SPREP	(Funds to be obtained)

9.0 MONITORING & EVALUATION

The DEPC has the role of coordinating the monitoring and evaluation of the implementation of this strategy. It is proposed to conduct an annual review of activities in the Action Plan with the involvement of the National Invasive Species Committee, SPREP and SPC using the 'targets' and 'means of verification'. Those activities that are part of donor-funded projects will also be monitored as part of those projects' reporting systems.

APPENDICES

Annex 1: Regional and international organisations and databases related to invasive species management.

(Source: Prepared by ISSG for Kingdom of Tonga's draft NISSAP (2013)).

Secretariat of the Pacific Commission (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.http://www.spc.int/

Secretariat of the Pacific Regional Environment Programme (SPREP)
SPREP works towards a Goal that, by 2015, all Members will have improved their 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 Strategic Action Plans.

The SPREP Biodiversity and Ecosystem Management Strategic Priority will be delivered through four main priority thematic areas: Invasive Species, Island and Oceanic Ecosystems, Threatened and Migratory Species, and Regional and International Instruments
http://sprep.org/Biodiversity-and-Ecosystems-Management/bem-overview

Pacific Islands Roundtable for Nature Conservation (PIRNC)
Formed in 1997 at the request of Pacific Island Countries and Territories, PIRNC serves as a forum whereby organisations working on nature conservation in the Pacific can improve their collaboration and coordination to increase effective conservation action. In particular it is the coordination mechanism for the implementation of the Action Strategy for Nature Conservation in the Pacific Island Region 2008-2012. The Action Strategy was endorsed by SPREP members, and highlights the priority concerns for conservation in the Pacific region as well as outlining a roadmap for achieving the key goals. It is to be reviewed in December, 2013.
http://www.iucn.org/about/union/secretariat/offices/oceania/roundtable/

PIRNC has a number of Working Groups, one of which addresses invasive species; the **Pacific Invasives Partnership (PIP).** PIP is the umbrella regional coordinating body for agencies working on invasive species in more than one country of the Pacific and promotes coordinated planning and assistance from regional and international agencies to meet the invasive species management needs of the countries and territories of the Pacific.
<http://sprep.org/Pacific-Invasives-Partnership/invasive-partnerships>

The following two regional programmes operate with the guidance and support of PIP:

Pacific Invasives Initiative (PII)

PII builds the invasive species management capacity of Pacific island countries and territories by providing technical support, training, assistance with proposal and project design, and links to expertise.<http://pacificinvasivesinitiative.org/pii/index.html>

Pacific Invasives Learning Network (PILN)
PILN is a professional network for invasive species workers in the Pacific and organises skills and learning exchanges, workshops and meetings, and facilitates multi-sector invasives teams in countries.<http://sprep.org/Pacific-Invasives-Learning-Network-PILN/piln-welcome>

International Union for the Conservation of Nature (IUCN) - Oceania Regional Office
IUCN Oceania is working with like-minded organisations to contribute to the conservation of species and ecosystems in the Oceania region. Increasing awareness about the importance of species and the threats they are facing is crucial. The concept of "Investing in Nature" is central to this approach: too often, humans take other species and their day-to-day uses for granted. It is vital that investments in natural resources promote sustainable long-term use, management and conservation of the species we utilise in our everyday lives.
<http://www.iucn.org/about/union/secretariat/offices/oceania/priorities/>

Hawai`i-Pacific Weed Risk Assessment
Hawai`i-Pacific Weed Risk Assessment (HPWRA) provides a free service. Professional botanists use published information to predict whether plants have a low-risk or high-risk of becoming invasive in Hawai`i or similar Pacific islands. The information is available on the Plant Pono website <http://plantpono.org/hpwra.php>. (HPWRA receives funding from the Hawai`i Invasive Species Council <http://www.hawaiiinvasivespecies.org/hisc/> and Plant Pono received funding for website development from the Kaulunani Urban and Community Forestry Program <http://www.kaulunani.org/>)

International Union for the Conservation of Nature (IUCN), Species Survival Commission (SSC), Invasive Species Specialist Group (ISSG)
The Invasive Species Specialist Group (ISSG) aims to reduce threats to natural ecosystems and the native species they contain by increasing awareness of invasive alien species, and of ways to prevent, control or eradicate them. ISSG is a major source of information on invasive species either through the Global Invasive Species Database (GISD) or by direct contact. <http://www.issg.org/about.htm>

Global Invasive Species Database (GISD)
The GISD focuses on alien species known to have negative impacts on native biodiversity and ecosystems. It features over 850 species profiles of some of the most harmful species. While there are taxon and geographical biases on selection of species (due to funding sources and priority themes) that are featured on the GISD, the Oceania region is well represented with a large number of harmful species listed. Other information extracted from the GISD included information on taxonomy, species organism type, common names, habitat type, biome, biostatus information and information on pathways of introduction and spread of these species.

Pacific Island Ecosystems at Risk (PIER)
The PIER database is focused on plant species that are known to have been introduced to the Pacific region including the Pacific Rim. Information extracted from PIER included biostatus of alien

species at island level, common names in Pacific languages, habitat information and most importantly links to risk assessments conducted for the Pacific region.

CABI Invasive Species Compendium (ISC)

CABI ISC is an encyclopaedic type of database on invasive alien species that impact biodiversity and livelihoods. CABI maintain compendia on Crop Protection, Forestry, Aquaculture and Animal Health and Production. The CABI ISC lists invasive species that impact biodiversity as well as pests of crops and pathogens. The focus for this project was on species that are known to impact biodiversity and ecosystems.

FishBase & SeaLifeBase

FishBase and SeaLifeBase are databases focused on all fish species known to science. Data and information included in FishBase includes ecological information, information on traits and distribution at country and ecosystem level including in the introduced range of fish species in the aquatic system (both marine and freshwater). SeaLifeBase consists of similar information on marine species.

Annex 2: Priority invasive species for management in Vanuatu

PLANTS

Big lif – *Merremia peltata*  *© Lilly F*	A widespread vine that is smothering forest and land cleared for agriculture and subject to significant control programmes on at least three islands, in addition to biological control research
Wan dei rop – *Mikania micrantha*  ©	A widespread vine that colonises cleared lands and lower scrub and forest habitats and subject to biological control. The current phase of ACIAR weed management project has developed biological control for this weed.
African tulip tree - *Spathodea campanulata*  © Starr environment	Dominating areas previously cleared of forest and invading some new islands. Biological control options are being developed as part of a regional project based in Cook Islands.
Bigfala Grasnel – Giant Mimosa – *Mimosa diplotricha*  ©	A major weed in pastures, plantations and roadsides and can also be cause serious health problems to humans and livestock. Biological control is to be developed in the next phase of the ACIAR project.
Piko – *Solanum torvum*  ©	This species is included in the next phase of the programme to research biological control options.

Wild peanut – *Cassia tora*  ©PJHB	A pest of livestock pastures whose seeds are transferred by cattle or in soil. Hard to control as re-sprouts if cut and management is for farmers to undertake. One of the target species for the next biological control program under the ACIAR weed management project.
Guinea Grass – *Panicum maximum*  © Bruce C	A pest of livestock pastures that is a growing problem and included as a target for future biological control research. A target species for the next biological control program with the ACIAR program.
Lantana – *Lantana camara*  *© Starr Environment*	A plantation or agricultural weed of livestock pastures.
Hiptis capitata  *© Baskoro*	An agricultural pasture pest found on Aneityum where eradication may be possible and also reported from Efate.
Parthenium hysterophorus  © Starr environment	A weed found along roadsides and cultivated areas, croplands, pastures. Can cause health problems. It is currently included in the biological control research program.

Urena lobata  © Starr environment	A weed found around disturbed areas, especially poorly managed pastures, scarified and eroded areas. Has spiked seeds that can be attached onto animal fur or clothing.)
Amaranth - *Amaranthus spinus*  ©	A weed of cultivated fields, roadsides, garbage heaps, and abandoned fields
Cat's claw creeper – *Macfadyena unguis-cati* 	Few infestations are found on fertile, well drained soils, but appears to tolerate most soil types, particularly alluvial ones. It is included in the target species for biological control research.
Wedelia – *Sphagneticola trilobata*	A very widespread agriculture and livestock weed that forms thick mats killing other plants, not planned for a national campaign.
Piper aduncum  © Starr environment	A very robust invasive plants that is still restricted to some islands of Vanuatu. It invades the natural forests both, primary and secondary forests and becomes well established.

Water Haisin - Water Hyacinth – *Eichornia crassipes*  © Starr environment	A significant pest of freshwater bodies that is currently being effectively controlled by a biocontrol agent.
Water Letes - Water lettuce – *Pistia stratiotes*  © Starr environment	A significant pest of freshwater bodies that is currently being effectively controlled by a biocontrol agent

MAMMALS

SPECIES	COMMENT
Rats (Rattus spp.)  © Starr environment	Rats are considered present throughout the country and whether there are any smaller offshore islands that are free of them is unknown. They are a major threat to native biodiversity, particularly birds, lizards and trees with edible seeds. They are also a significant agricultural problem – e.g. the main cocoa pest in Vanuatu. Farmers attempt control with toxic baits. No control is currently happening to project native species or sites of high importance to biodiversity.
Feral livestock (pigs, cattle)  ©Starr environment	These are considered pests in some areas where they are damaging important areas of native forest, but others hunt them as a food source. No control programmes are occurring.

Feral cats  © Starr environment	A significant predator of birds and reptiles but no control programmes in place.

BIRDS

SPECIES	COMMENT
Sako - Indian myna  © Lilly F	A pest with impacts on native birds and fruit crops. Has been subject to some local control. Absent from more than half the main islands and efforts proposed to maintain this situation.

INVERTEBRATES

SPECIES	COMMENT
Giant African snail – *Achatina fulica* 	A significant agricultural pests that has not yet reached all the country and efforts proposed to keep it out of Torba Province. Subject to some control by a flatworm.
Fire Anis - Little fire ant – *Wasmannia auropunctata*  © PII	Found in islands in the Banks Group and Efate and Santo this species has a very painful bite that impacts significantly on peoples' lives and has been subject to past containment efforts. Delimiting surveys and eradication from some sites is proposed.

Yellow crazy ant – *Anoplolepis gracilipes*  © PII	A widespread species that can undergo damaging explosions in number through formation of super-colonies. Has significant impacts on biodiversity and has been the subject of control on Mystery Island where high numbers disrupt tourism.
Fruit flies – *Bactrocera* spp. 	Fruit flights threaten fruit crops and exports and a surveillance programme supported SPC is to be revitalised.

FUNGI

SPECIES	COMMENT
Heliconia rust *Puccinia heliconiae* 	This relatively recently introduced fungus is damaging the leaves of Heliconia which are a key element in the national dish of lap-lap.

MARINE ORGANISM

SPECIES	COMMENT
Crown of thorns starfish - *Acanthaster planci*  © Sarah Graham	This native species periodically has outbreaks when its numbers build up enough to damage coral reefs. Programmes to remove starfish and test poisoning methods are in place.

Annex 3: Attendees at NISSAP development workshops

LIST OF PATICIPANTS AT THE LUGANVILLE NISSAP WORKSHOP

Date : 16/04/14

Workshop Venue: Sanma Womens Center
Facilitator: Bule Sylverio, Lilly Fatdal, David Butler, David Moverely

#	NAME	ORGANISATION	POSITION	EMAIL	MOBILE #
1	Massing Bong	Malampa Provincial Government	West Ambrym Area Secretary	eera.bong88@gmail.com	7756485
2	Michael Silona	Torba Provincial Government	Provincial Planner	msilona@vanuatu.gov.vu	5971276
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4	James Sarai		Chief	none	5363160
5	Vuti Takasi	Sanma Province	AreaSecretary	none	5946335
6	Thoe Jean-Pierre	Sanma Province	South East Area Secretary	none	5353704
7	Newman Tangis	Sanma Province	Youth & Sports Officer	none	5536717
8	Paul Mark	Sanma Province	AreaSecretary	none	5471685
9	Chief Solomon Tavue	Vatthe Conservation	Chief	none	
10	Pakoro Remy	Sanma Province	AreaSecretary	none	5949543
11	Leon Macreveth	Sanma Province	AreaSecretary	none	5413143
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18	Roslyn Garae	Penama Cultural Field Officer	Women Representive	none	5917184
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LIST OF PATICIPANTS AT THE PORT VILA NISSAP WORKSHOP

Date : 14/04/14

Workshop Venue: Vanuatu Cultural Center

Facilitator: Donna Kalfatak, Lilly Fatdal, David Butler, David Moverely

#	NAME	ORGANISATION	POSITION	EMAIL	MOBILE #
1	Berthy Vireial	Ministry of Public Utilities	Senior Admin Officer	vberthy@vanuatu.gov.vu	
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12	William Billy	Shefa Province	Area Secretary		7713593
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16	Philemon Ala	Forestry Department	Assistant Botanist		
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19	Leisara Kalotiti	Shefa Provincial Government	Women Representive		7774910
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23	A.John Viriam	Shefa Fishermen Association	President		5983113
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LIST OF PATICIPANTS AT THE PORT VILA REVIEW OF DRAFT NISSAP

Date : 06/05/14

Workshop Venue: Ministry Of Land's Conference Room

Facilitator: Lilly Fatdal, David Butler

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5	Yasmine Kamasteia	Maritime Affairs			7110562
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10	Peter Iesul				
11	Peter Kaoh				
12	Zoe Ayong				
13	Primrose				

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: http://www.issg.org/database/species/ecology.asp?si=58&fr=1&sts=&lang=EN (Electric ant (*Wasmannia auropunctata*)