

ENVIRONMENTAL EDUCATION FOR SUSTAINABILITY

Resource Booklet for Teachers



Department of Education
in partnership with the
Ridge to Reef Project
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INTRODUCTION

The information in this booklet comes from the Project Document for the Ridge to Reef project¹. The Project Document contains valuable background information for teachers. In some instances the information has been copied direct; in other cases it has been reworded to assist teachers in their classroom planning.

The Department of Education acknowledges the depth and breadth of research carried out by the Project team and is grateful to the Project team that teachers can use the information in the classrooms to improve students' understanding about environmental education for sustainability. By integrating environmental education for sustainability into the Niue Curriculum the Project team is helping students understand the importance of "sustainable use and management of Niue's natural resources and environment for present and future generations" (5th Pillar of the Niue National Strategic Plan 2014-2019).

Niue also has a number of resources (posters, pamphlets, farms, forest, marine areas and people) that would be useful to use in the classroom, and to see and listen to on trips outside the classroom.



Environmental Education for Sustainability on Niue presents a wonderful opportunity to explore story telling as part of learning about, for and in the environment. People as a key resource should be encouraged.

This resource is intended to be used alongside the Environmental Education for Sustainability Guidelines. Throughout the booklet there are questions and ideas placed at the end of each section. These are prompts to assist teachers in thinking about planning a teaching moment or an activity that is appropriate for their learners. In some instances it might be appropriate for the learners to find out themselves as part of their inquiry work. This resource has been developed as a guide about the information and for teachers to dip into when planning to teach about environmental education for sustainability.



NIUE OVERVIEW

¹ The document is the property of Ridge to Reef team who are valuable resources for environmental education for sustainability. The document was compiled for funding purposes from GEF as part of the United Nations Development Programme.

Niue is an upraised coral atoll island lying 480 km east of Tonga, 550 km southeast of Samoa and 2,500 km north of New Zealand. At 259 km² in area - the largest island of its type - it consists of a former lagoon surrounded by the remains of a reef rising to about 68 m above sea level, surrounded by an outer terrace at approximately 28 m above sea level. The outer terrace ends in steep cliffs which descend on to a narrow fringing reef.

Niue is dependent on its natural environment and ecosystem services for its quality of life and its economic viability. The natural environment, in all its forms, is a valuable economic asset as it provides the attraction for visitors and tourists which are the mainstay of the Niuean economy.

The environment also provides food and other necessities for residents of Niue. Biodiversity is very important to the economy of Niue with about a fifth of its GDP coming from the agriculture, fishery, forestry and hunting sectors². It is also the basis for subsistence lifestyles and has cultural significance. 70% of the country retains a cover of forest and 23% of it is in conservation areas, primarily the Huvalu Conservation Area.

“The forest is the critical habitat for three prized food species – fruit bats, wood pigeons and coconut crabs. The forest also yields edible ferns, medicinal plants and minor wood products.”³ In addition, the environment provides and protects the groundwater aquifers which are the main source of drinking water for the entire population of residents and visitors.



TEACHING AND LEARNING OPPORTUNITIES

- What is a coral atoll? A lagoon? A reef? An ecosystem? Biodiversity? GDP? Subsistence lifestyles?
- How do we use a map? Where on the map are Tonga, Samoa, New Zealand and the Huvalu Conservation Area?
- What do learners know about fruit bats, wood pigeons and coconut crabs?
- What is an aquifer? Why is it so important?

² Department of Environment and David Butler (2014) Fifth National Report to the Convention on Biological Diversity – Niue. Government of Niue.

³ From the Fourth National Report to the CBD3

THE NIUE ENVIRONMENT

The physical environment

Niue is the world's largest single raised coral atoll⁴ an uplifted coral limestone plateau perched on top of a submerged volcano with the surrounding ocean depths reaching over 4,000 m at the edge of the Tonga Trench. It is located in the South Pacific Ocean (Lat 169o55'W, Lon 19o02'S), has a total land area of 259 km² and an Exclusive Economic Zone (EEZ)⁵ of about 340,000 km².

It is described by the NBSAP⁵ as comprising a central plateau of gentle undulating relief, slightly dished in shape with the rim at about 68 m above mean sea level, dropping to about 30 m in the centre suggesting it was once a lagoon. A narrow lower terrace 100 m to 200 m wide at about 28 m above sea level surrounds this central plateau. The coastline is rugged, and consists of precipitous cliffs which drop straight into the sea, except for the west coast where there is a wave-cut rock platform 20 m to 80 m wide and then a very steep drop-off to the ocean floor. The distinct shelving suggests that the island was uplifted in at least two tectonic episodes.

The island's natural geology is pure limestone of three types – reef rock, beach conglomerate and cemented or loose coral sand. A characteristic, typical of limestone environments, is the large number of caves and caverns many with distinctive stalactites and stalagmites and other evidence of the dissolving forces of water such as natural arches and chasms.

Water

There are no permanent streams or rivers on the island. A freshwater lens, located approximately 60 m below the rim of the central plateau that is replenished by rainwater filtering down the soil and rocks, is the main source of freshwater on the island. The daily abstraction rate from the PWD public water supply wells is well below sustainable levels of the freshwater yield.

The ground surface is often jagged with exposed sharp rock outcrops and boulders, with pockets of shallow topsoil between them.

There are four types of soil in Niue:

- (1) Hikutavake: outer fringe of the island
- (2) Hakupu: coconut/pasture soil
- (3) Fonuakula: pasture soil, and
- (4) Palai: forestry soil, root crops.

Soils

The soils of Niue in general are well supplied with phosphorus and potassium, but there are a few areas that are deprived of these nutrients for plant growth which makes crop production difficult. Some soils also lack nitrogen as can be seen by the yellowing of leaves on some vegetation. Burning of some areas for cropping is common and this may be the reason why some areas are



⁴ Kruger, J (2008) Niue Technical Report – High Resolution Bathymetry Survey. EU EDF-SOPAC Project Report 49 Reducing Vulnerability of Pacific SPC States

⁵ Refers to the Niue National Biodiversity Strategy and Action Plan of 2001

deprived of nitrogen. The supply of calcium, magnesium and many of the trace elements seems adequate for plant growth in most areas.⁶

The Reef

The Niuean coastal reef platform is comparatively narrow overlaid with a thin layer of coral and plunges down to depths of 30-40 m before the drop off into deep water. Niue's coastal water quality is impacted by the effluent of land activities (e.g. septic tank and storm water discharge) which threatens the coastal fishery environment.

Climate

The current climate of Niue comprises two distinct seasons – a warm wet season from November to April and a cooler dry season from May to October. Niue's wet season is affected by the movement of the South Pacific Convergence Zone. This band of heavy rainfall is caused by air rising over warm water where winds converge, resulting in thunderstorm activity. It extends across the South Pacific Ocean from the Solomon Islands to the Cook Islands.

Niue's climate is also influenced by sub-tropical high pressure systems and the trade winds, which blow mainly from the south-east. Niue's climate varies considerably from year to year due to the El Niño-Southern Oscillation. Precipitation averages 2,000 mm/year, but according to NDMCC⁷ in the wettest years it can be almost four times the rainfall in the driest years.

Severe droughts have occurred in Niue, most recently in 1983, 1991 and 1998.” However while the future groundwater demand from the additional production and irrigation boreholes remains to be determined, it appears the existing groundwater is safely within its sustainability capacity.

The average daytime temperature is 27°C from May to October and 30°C from November to April. December to March is the tropical cyclone season.

TEACHING AND LEARNING OPPORTUNITIES

- What is a submerged volcano? Tonga trench? Tectonic episode? Limestone?
- What do learners know about Stalactites and stalagmites? Chasms and arches?
- How does Niue get its water?
- On a map of Niue can learners shade in the different types of soil?
- Describe the soils of Niue. Why are growing crops a challenge?
- What threats are there to the coastal water?
- Is fresh water a problem on Niue?

⁶ Refer <http://www.fao.org/ag/agp/AGPC/doc/Counprof/southpacific/niue.htm>

⁷ NDMCC refers to the Niue Department of Meteorology and Climate Change

Ecosystems and biodiversity

In spite of its small size and uniform geology and geomorphology, Niue has a modest range of ecosystems and habitats and these are summarized in the following figure. They can be considered as comprising two clusters – terrestrial and marine and each of these is described below.

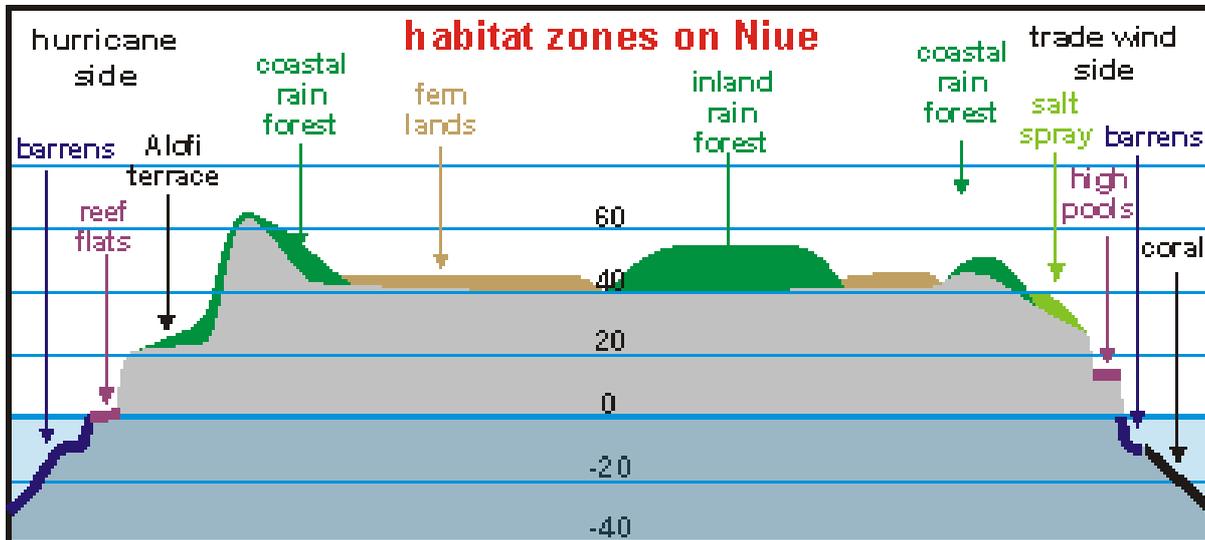


Figure 2. Niue habitat zones

Terrestrial ecosystems

Niue's terrestrial ecosystems consist of forests, agro-ecosystems, settlements, and a rugged and rocky coastline of steep cliffs, caves, chasms and blow holes. Many caves host brackish and freshwater pools. Much of Niue's land can be considered karst ecosystem. The island's vegetation consists of fern land, littoral shrub land, littoral forest, coastal forest, matured forest and secondary forest.

Available information suggests that Niue's plant diversity includes 175 native vascular plants, and 26 potentially invasive introduced species

Forests

Niue's forested area covers 26,103 ha and comprises mature dense forest (5,566 ha), regenerating medium dense forest (13,191 ha) with higher biodiversity than the mature forest, and littoral forest, fern-land and non-forested areas classified as 'other' forest areas (7,346 ha) in the Forestry Management Plan.

The forests are well- stocked with a range of sizes, showing that they regenerate very well after natural disturbance by cyclones. The mature forest occurs largely in the central east of the island, a close canopy that is dominated by native species with Kolivao (*Syzygium richii*) and Kafika (*S. inophylloides*) making up over half of the forest canopy. According to the Forestry Management Plan, other major species occurring in lower numbers include Moota (*Dysoxylum forsteri*), Kanumea (*Planchonella torricellensis*), Tava (*Pometia pinnata*), Le (*Macaranga seemanii*), Kieto (*Diospyros samoensis*), Ai (*Canarium harveyi*). A local screwpine *Pandanus niueensis* has been described from Niue. Most if not all of the major species have traditional uses such as canoe building and earth oven baking. Some invasive species significant to Niue as a source of food and timber include Mango (*Mangifera indica*), Vi (*Spondias dulcis*) and Pomea (*Adenanthera pavonia*).

Fauna

Among the fauna that have been recorded there are 32 bird species, (six sea birds, 11 shore birds and 15 land birds), nine lizard species (four geckos and five skinks), over 376 insect species, one native mammal (*Pteropus tonganus*), and eight land crab species of which the coconut crab (*Birgus latro*) is the largest. There are also a number of introduced mammals including two rat species, the house mouse, pigs, dogs and cats.

Invertebrates restricted to Niue include a recently described butterfly, the Niue Blue (*Nacaduba niueensis*). Other endemic invertebrates include a rattlebox moth *Utetheisa maddisoni*, a leafhopper *Empoasca clodia*, a planthopper *Macrovanua* (or *Vanua*) *angusta*, a weevil *Elytrurus niuei*, a scale insect *Paracoccus niuensis*, a land snail *Vatusila niueana*, a crab *Orcovita gracilipes*, a cave-dwelling crustacean *Pugiodactylus agartthus*, an ostracod crustacean *Dantya ferox*, and a periwinkle *Cenchrites* (or *Tectarius*) *niuensis*. Niue is also home to some regionally endemic butterfly species such as *Belanois java schmeltzi* (found also in Samoa and Tonga), *Jamides argentina* (found also in Samoa), and *Euploea lewinii perryi* (also in Cook Is).

Two endemic bird species have also been described from Niue¹⁷, the Polynesian Triller (*Lalage maculosa whitmeei*), and the Polynesian Starling (*Aplonis tabuensis brunnescens*).

From a global perspective, Niue has some important terrestrial species include the Endangered Olive Small-scaled Skink, and the globally vulnerable Bristle-thighed Curlew that is an occasional visitor. Several globally vulnerable seabirds have been recorded at least once in Niuean waters but none breed on the island. Niue is listed in WWF's globally important Ecoregions under Tropical and Subtropical Moist Broadleaf Forests under South Pacific Islands Forests. Niue also falls within the Micronesia-Polynesia Hotspot as delineated by Conservation International.

TEACHING AND LEARNING OPPORTUNITIES

- What can learners find out about the range of trees in the forest and how they have been used in the past and are they currently in use?
- Find out if learners can identify the fauna?
- Do they know what is native and what has been introduced? Which species are vulnerable? Are there any extinct species?
- What interesting activities could you develop about the species found on Niue?



Marine ecosystems

Niue's marine ecosystems include the narrow fringing reef around the island, seamounts (notably Endeavour Seamount, and Lachlan Seamount), submerged atolls (e.g. Beveridge Reef and Antiope Reef), and open ocean. The total area of reef flat and sub-tidal reef has been estimated at 620 ha and an Exclusive Economic zone (EEZ) of 340,000 km².

Marine biodiversity comprises 34 coral genera, over 240 fish species, invertebrates comprising around 20 species of crabs and crayfish/lobsters, two giant clams, five species of beche-de-mer and others.

Niue's marine ecosystems host a number of globally important species, including the endangered Fin Whale (*Balaenoptera physalus*), Humphead Wrasse, and Green Turtle, and the vulnerable Green Humphead Parrotfish, Whitetip Oceanic Shark, Queensland Groper, Flat-tail Sea Snake, Whale Shark, Bigeye Tuna, Blacksaddled Coral Grouper, Sperm Whale, and Blue Marlin.



Green Turtle



Flat-tail sea snake



Fin Whale

Many globally vulnerable coral species are also found in Niue's extensive exclusive economic zone. These include *Acropora globiceps*, *Acropora horrida*, *Acropora retusa*, *Acropora speciosa*, *Acropora striata*, *Acropora vaughani*, *Alveopora allingi*, *Alveopora verrilliana*, *Astreopora cucullata*, *Heliopora coerulea* (Blue Coral), *Leptoseris incrustans*, *Montipora angulate*, *Montipora australiensis*, *Montipora calcarea*, *Montipora caliculata*, *Montipora lobulata*, *Pavona bipartite*, *Pavona cactus*, *Pavona decussata* (Cactus Coral), *Pocillopora elegans*, *Porites nigrescens*, *Turbinaria mesenterina*, and *Turbinaria reniformis*.

Anecdotal reports indicate occurrence of the invasive crown-of-thorns starfish (*Acanthaster planci*) in low numbers. One endemic marine fish has also been described from Niue – the Combtooth Blenny (*Ecsenius niue*). The Niuean Flat-tailed Sea Snake (*Pseudolaticauda* or *Laticauda schistorhynchus*) is also sometimes considered to be endemic.

Indicator species monitor trends in reef communities, including the health of the reef, and the effectiveness of management strategies. The indicator species on the reef flat include target species such as the vermetid tube worm *Serpulorbis colubrinus* and the purple jewel box oyster *Chama isostoma*. *Holothurian* species are also good indicators for reef flat health due to their detrital feeding behaviour.

Depletion of *Holothurian* abundance may indicate a polluted shoreline. Indicators on the reef slopes include coral cover, algal cover, and the abundance of corallivore species such as the crown-of-thorns starfish (*Acanthaster planci*) and the mollusc *Drupella* spp. Coral disease brought about by coral bleaching, coral predation and overfishing of herbivorous fish can lead to increased algal cover.

The structure of coral communities on reef slopes resists wave action and creates shelter and refuge for many reef species. Shallow pools along the exposed reef flats provide refuge for mobile invertebrates. There are also deep pools and crevices along the reef flat with greater tidal flow and wave flushing creating a more suitable environment for a greater diversity of reef communities.

TEACHING AND LEARNING OPPORTUNITIES

- What are seamounts?
- How can the numerous marine species be introduced into the classroom?
- What does endemic mean?
- How can you introduce studies about the health of the reef into classrooms?



TRADITION, CULTURE AND HERITAGE

It is important to know the historical context in which decisions are made. Traditional beliefs are still the basis of many decisions today. When teachers talk about current environmental practices, teachers should be able to build new knowledge onto the past.

Niue's first settlers who were predominantly from Samoa, Tonga and Pukapuka are responsible for shaping Niue's traditional and customary structure. The elements or characteristics of the land, earth, sky, heavens and sea were the basis for the formation of traditional and customary values. These values have evolved and modified over the years, more so with the introduction of Christianity which most, if not all, Niue traditions and customs are linked to.

Recognising the importance and the need to preserve its culture and heritage, the Government of Niue established the Tāoga Niue Department in 2004/05. Tāoga Niue means the treasures or precious possessions of Niue and these are also featured as one of the key pillars in the Niue National Integrated Strategic Plan 2014-2019.

The Tāoga Niue website⁸ refers to Niue's culture, based on spirituality, language, heritage and social values, and aims for it to thrive and be celebrated. It also notes the precious heritage treasures into which a Niue person is born, and goes on to say that these are treasures which are fostered and handed down by the tau tupuna from generation to generation. These heritage treasures are represented by:

- Language
- Customs and traditions
- Arts and Crafts
- History
- Environment

Language

The Niue language (ko e Vagahau Niue) is a Polynesian language, belonging to the Malayo- Polynesian subgroup of the Austronesian languages. It is most closely related to Tongan and slightly more distantly to other Polynesian languages such as Māori, Sāmoan, and Hawaiian. Māori. Together, Tongan and Vagahau Niue form the Tongic subgroup of the Polynesian languages. Vagahau Niue also has a number of influences from Samoan and Eastern Polynesian languages.

The language originated as a blend of languages of the first settlers. In early times when the North (Motu) and South (Tafiti) were in conflict, the pronunciation and subsequently the spelling of words became distinct between the two regions. The arrival of Christianity introduced the English language which has now become an important language for communication in schools and business limiting the use of the Niuean language to family and village life. Locals alternate between the two languages in everyday conversations.

⁸ Found at http://www.taoganiue.nu/?page_id=2

Customs and tradition

The pre-Christian era was a time of warfare and intense rivalry between the north and south, “*motu*” and “*tafiti*” respectively. Land, resources and sacred objects were amongst entities fought over. The arrival of Christianity in the mid-1800s brought peace and order leading to the formation of communities and consequently the establishment of the hierarchy system whereby elders were elected as church leaders. The elders had the responsibility to allocate land to each family who respected and accepted what was given to them. From this time within each family, there has been a preference for patrilineal inheritance of real property such as land and an emphasis on primogeniture. Women had some rights but these were not as strong as those of males. The general perception was that women, once married, would benefit from their husband’s inherited land and resources.

With the New Zealand administration in 1901 came the New Zealand court system which introduced land entitlement. No other aspect of Niuean customs and tradition is more strongly observed than land tenure and property²³. Land is inalienable and cannot be sold or deeded permanently to non- Niue peoples and the Land Court is probably the most important and contentious aspect of the judicial system. Major political struggles revolve around the dilemma posed by absentee landowners which can cause considerable tension in some families.

Traditional knowledge can be categorised into three levels: the family, village and the national level. Within families, it is rarely shared for conservation purposes. This is perhaps the obstacle for many environmental managers who wish to incorporate traditional practices into conservation management plans. The interpretation of traditional knowledge by each generation can be different which may improve, evolve or dilute the knowledge. Many Niuean families establish tapu areas which, in most cases, are not known to the public. As a result, the integrity of the tapu can be jeopardised, whether the purpose of the establishment is spiritual or conservation.

At the village level, the establishment of tapu areas has generally been for conservation purposes. The only other allowance for restriction is for an area of sea where a death of a person has occurred. A community-based management approach is more commonly applied to marine resources and habitats perhaps because the marine environment is not privately owned, lacking the element of disputes typically experienced with land. The process of establishing a protected area by villages is not usually brought about by recommendations from the Government but rather from concerns raised by village members. Usually a meeting is called and management actions are discussed and agreed upon by all members of the village – the action is usually the closing of an area to fishing. It is common practice for villages to establish restrictions for the marine environment without informing or following Government procedures.

Traditionally, native species of flora and fauna have not only provided food security but have been linked to communal activities and relations connected to traditional practices. Taro, yam, demersal and pelagic fish as well as wild local vegetables have traditionally been the main diet for Sunday lunch and national gatherings such as haircutting, ear piercing and New Year ceremonies. Other traditional species are those used in making costumes for cultural dances, musical instruments, and traditional sports.





Traditional fishing is symbolised by the *vaka* (traditional canoe) as this provides the means to feed the family and community, and nowadays obtain supplementary income. Building a *vaka* has a lot of significant traditional values starting from the choice of a suitable tree, onto the construction and then the use for catching fish. This process takes time, skill and patience to complete and it provides rewards such as satisfaction, pride and the promise of a good catch. A *vaka* building project is currently underway in the village of Avatele. It is a cultural activity for young people of Niue, in that it provides knowledge and

practice that will enable them to maintain traditional and cultural ways. This will also encourage communal participation with knowledge sharing and skills that are passed on to the next generation.

At the national level, Niuean culture and traditions are increasingly gaining recognition and relevance in environmental management plans and tourism development. The establishment of Tāoga Niue by the Government is to ensure that the use of Niue's *tāoga motu* is done in a way that strengthens and protects its value. Tāoga Niue defines its main task of documenting traditional knowledge as the most challenging due to lack of resources and cooperation by those who possess the traditional knowledge. Documenting our culture and traditions they say protects the expressions of our culture and strengthens our appreciation and value of the Niuean heritage.

The Tāoga Niue Act 2012, among other goals, seeks to ensure Niue's traditional knowledge is not exploited commercially. Niue is party to the World Intellectual Properties Convention which can help Niue protect its traditionally significant resources such as taro. One of Niue's taro species is a high value product successfully grown and marketed as "*Talo Niue*" by other countries in the region with no direct benefits to Niue. Tāoga Niue endorses the adoption of customary practices through legislation so as to ensure their implementation and longevity.

Arts and crafts

Songs and dance serve as a way of expressing opinion or views towards the country's structure, whether it is political, social, economic or environmental. They are significant to each village and performed in cultural and traditional ceremonies. Costumes and musical instruments (drums and ukulele) are made from local plants. Handcrafts and woodcrafts are also constructed from local materials. As with the Niuean language, Niuean art is similar in many ways to other Polynesian countries.

There has been a recent revival of several handicrafts, such as the building of canoes by hand and the making of hiapo (tapa) cloth from mulberry bark.



Figure 3. A modern hiapo design by Niue artist Charles Jessop

Unlike some other Polynesian cultures, Niue peoples have not had a strong tradition of preserving historical artifacts, oral storytelling or the recitation of genealogies.

According to the Niue website⁹, Niue's history falls into four defined periods: pre-Christianity, Christianity, the Colonial era and self-government. The documentation of Niue's history was primarily oral and passed down through the generations. It has only been since the period of New Zealand governance that a great deal of literature has been compiled on Niue's history.

Niue is believed to have been inhabited for over a thousand years. Oral tradition and legends speak of the first settlement by Huanaki and Fao, together with the Fire Gods from Fonuagalo, the Hidden Land. Some authorities believe that the island was settled during two principal migrations, one from Samoa and one from Tonga with a smaller migration from Pukapuka in the Cook Islands. In 1774, the English navigator Captain James Cook sighted Niue but was refused landing by the locals on three different attempts. He then named Niue 'Savage Island'. Missionaries from the London Missionary Society established Christianity in 1846. Niue chiefs gained British Protectorate status in 1900, and in 1901 Niue was annexed to New Zealand. In 1974 Niue gained self-government in free association with New Zealand and government to this day has followed a Westminster-style rule with a 20 member assembly. The Premier is selected by the House and the Premier then selects three other members for Cabinet posts.



⁹ <http://www.niueisland.com/content/history>

THE SOCIO-POLITICAL ENVIRONMENT

Government

Following a plea from British missionaries and island leaders, the island became a British Protectorate at the turn of the 20th century. Shortly thereafter, in an agreement with the British government, New Zealand took over responsibility for Niue in 1901 and it remained a territory of New Zealand until October 1974 when a referendum took place regarding Niue's Constitutional future. The result supported the change to internal self-government in free association with New Zealand. The Niuean translation of Self Government is *Pule Fakamotu*, meaning for Niue peoples to lead, make decisions and do their own thing. Under the constitution New Zealand is responsible for Niue's defence, external affairs and for providing administrative assistance¹⁰

Niue's system of government is based on the Westminster system. The Niue Assembly consists of 20 members, 14 of whom are elected by village constituencies and 6 from the common roll. The 20 members elect a Premier and the Premier selects three cabinet ministers from the 19. Members elect a Speaker from outside their ranks. A general election is held every three years.

From 2003 to 2013, the Government of Niue has been driven by one vision, a prosperous Niue, '*Niue ke Monuina*'. This vision inspired the Niue Integrated Strategic Plan (NISP) for 2003 to 2008, and then the Niue National Strategic Plan (NNSP) for the following 5 years (2009-2013). The new Strategic Plan for 2014 to 2019 has a new pillar of environmental protection and management. The overall objective and aspirations as reflected in previous Strategic Plans remain - to build a sustainable future that meets the economic and social needs of the country while preserving environmental integrity, social stability, and the Niue culture.

In December 2013, the Niue Public Service Commission established three Ministries (Natural Resources, Social Services, and Infrastructure) and one Central Agency (comprising Crown Law, Finance and Planning (Treasury), Cabinet and Parliamentary Services and Police) as an overall transformation of the Niue Public Service. The groupings for the entities were drawn from the development pillars of the NNSP. The new structure is envisioned to improve the implementation and the achievement of outcomes under the NNSP.

The Ministry of Natural Resources is comprised of the three key departments; Department of Agriculture, Forestry and Fisheries; Department of Environment; and the Department of Meteorological Services. The Ministry of Social Services comprise of Department of Education, Health, Taoga Niue, and Justice, Lands and Surveys; and the Ministry of Infrastructure is comprised of the Department of Transport (Civil Aviation and Public Works Department), the Department of Communications (the technical component of the Broadcasting Corporation of Niue and Telecom Niue), and the Department of Utilities (Niue Power).

TEACHING AND LEARNING OPPORTUNITIES

What responsibilities do the Government of Niue and the 14 villages have in promoting environmental education for sustainability? How can they carry out their responsibilities?

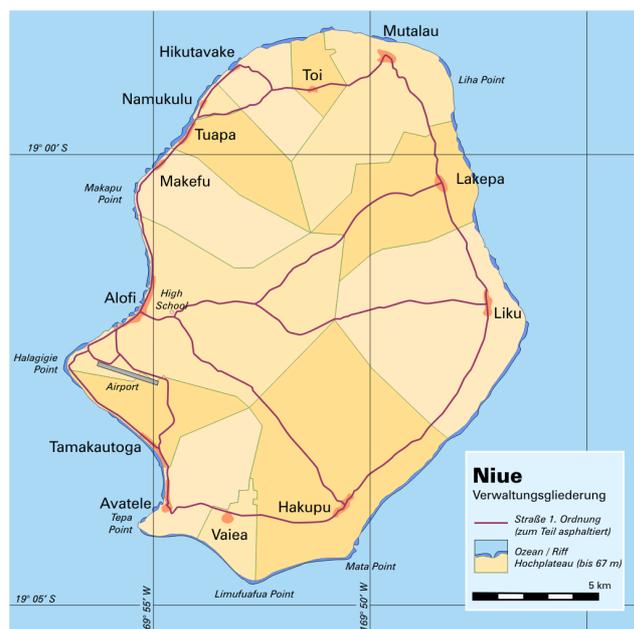
Village Councils

There are 14 Villages in Niue each with a Village Council (see map). Village Councils, which provide a degree of local administration, are made up of five volunteers from within the village. From the five, a

¹⁰ Following self-rule, Niueans retained their New Zealand citizenship, a contributing factor for the large presence of Niueans in Auckland.

chairperson, secretary and treasurer are elected. This roster is renewed every three years or remains the same subject to agreement by all village members.

Each member of the Village Council is responsible for a portfolio which covers areas such as village show days, marine days, youth activities, facility maintenance, government projects etc. Village Councils meet at least once a month at the village function building or whenever there is an urgent matter to discuss. It is important to note that Village Councils only manage activities which are not church-related as the church has its own committee which manages its activities. Village Councils are granted NZD10,000 (around USD8,000) per term by the central government and these funds are used to achieve the outcomes proposed for each portfolio. Village Councils also hold fundraising activities throughout the year to help achieve some of their goals. An important responsibility of Village Councils is the preparation of a Village Management and Development Plan. However, only two villages to date have developed a plan. These villages are the larger and more populated ones on the Island.



Demographics

The 2011 census recorded a total population of 1,607, 795 males and 812 females. Niue's highest recorded population came in 1969 with 5,296 residents but there has been a steady decline since then. The 2011 census described Alofi North and Alofi South villages as the urban areas of Niue and the rest of the villages are considered rural. It was estimated that one third (37%) of the total population of Niue resided in the urban area of Alofi and the remaining two thirds are in rural areas. Children under the age of 15 make up 26% of the population while those 65 years and over account for 12%. The crude birth rate is around 20 per 1,000 population and crude death rate is 7.8 per 1,000 population.

It has been reported that in 2006 the Niuean population in New Zealand was the fourth largest Pacific Island ethnic group. The population of 22,473 Niue peoples was a 12% increase between 2001 and 2006. About 16,275 Niueans are born in New Zealand which is 74% of the total Niuean New Zealand population. Around 25% of this total is able to converse in Vagahau Niue. Statistics New Zealand reported that 78% of the Niuean community resided in Auckland in 2001. The Niuean New Zealand community have continued to practice Niue traditions in formal ceremonies and hold village sports competitions throughout the year. There are established Niuean churches which the majority of Niue peoples attend and where women's and youth groups exist for activities such as handcrafting and singing. There are also Niuean language classes and Niuean early childhood centres to teach the Niuean language from a very early stage.

LAND USE AND MANAGEMENT

Almost 99% of land in Niue is owned by families under customary land ownership based on traditional rights of families and their descendant groups. Such traditional lands belonging to traditional Niuean families are managed by a trustee (called “*leveki magafaoa*”) on their behalf. Total land percentage belonging to the State is registered as 1% with an additional 4% from leases of traditional lands.

Land use data sources are not consistent but this could be because they are reflecting different years. Probably the latest available statistics²⁸ are as in the following table.

LAND CLASSIFICATION	PERCENTAGE	ACTUAL HECTARES
arable land - land cultivated for crops like taro, banana, and vegetables that are replanted after each harvest	15.38%	4,000 ha
permanent crops - land cultivated for crops like vanilla, noni, papaya, that are not replanted after each harvest	11.54%	3,000 ha
other - any land not arable or under permanent crops; includes forests and woodlands, built-up areas, airport, roads, barren land, etc	73.08%	19,000 ha

Table 1. Land Classification in Niue

Agriculture

The Agriculture census (2009) estimated from the 466 households surveyed, that 422 (91%) were active in agriculture and 44 (9%) were not. Of the agriculture households, 64% were subsistence farmers and 23% were engaged in both subsistence and cash activities. An estimated 764 ha of land was used in agriculture at the time of the census. About 90% of parcels of land were between 0.2 ha and 2 ha in size. There were 429 agricultural holdings and 1,267 parcels. The agriculture sector accounts for 23.5% of GDP²⁹.

The Department of Agriculture Forestry and Fisheries (DAFF) since 2010 has been implementing a Sustainable Land Management Project which is a very effective demonstration of sustainable use of land for farming of essential resources. This project is located in Mutalau. It has agroforestry areas, Mucuna trial areas, a composting area and a vegetable garden including a plantain banana area.

The project serves to educate communities on sustainable use of land. One of its objectives has been to implement and improve soil rejuvenation systems through large scale composting methods and organic farming practices. A few farmers have successfully utilised Mucuna legume to rejuvenate the soil. It has the ability to suppress weeds and fix nitrogen. DAFF’s main farm facilitates the trial of small and medium scale composting and other organic methods of improving crop growth whilst reducing negative impacts on the soil and underground features. DAFF has also facilitated in the setting up of village based vegetation blocks which provides a space for communities to grow their own vegetables.

Forestry

Under the system of land ownership in Niue there are no formal public forest reserves. However, there are 160 ha of mature forest declared by the landowners as *tapu* areas for the conservation of wildlife habitat and cultural sites.

The Huvalu Forest Conservation Area is the largest area specifically managed for conservation and sustainable resource use. It comprises an area of 5,400 ha, consisting of 100 ha of *tapu* where hunting,

logging and research are prohibited. This is surrounded by 2,500 ha of primary forest in which some hunting and other activities are permitted. Beyond this area is a buffer zone of 2,800 ha of agricultural land that is subject to controlled, shifting cultivation (arable land).

The Code of Harvesting Practice for the Indigenous Forests of Niue (2004) provides practical and rational guidelines to all those involved in forest harvesting, aiming at reducing forest damage and improving forest yields. The Code provides sets of best practice covering both environmental and operational matters and also specifies uniform safety standards and prescriptions, which must be adhered to in any forest harvesting operation. The protection of flora and fauna in forest areas is important.

Conservation measures for this purpose include retaining strips of unharvested forest to maintain habitat diversity, with such strips connecting to larger patches of forest that will not be harvested. The protection of rare and endangered species and communities in harvested areas by modifying harvesting prescriptions or leaving patches of uncut forest is also a conservation measure for animals and plants. Some of the management practices include minimising disturbance to residual trees and soil areas to avoid damaging the productive and regenerative capacity of the forest. Harvesting operations are required to avoid disturbance to protected areas and their buffer zones. Recommendations are also made on equipment characteristics such as using narrow blades no wider than the tracks of the machine so as to reduce damage to remaining trees.

TEACHING AND LEARNING OPPORTUNITIES

- Discuss the land use table.
- What can learners find out about the impact of the project in Mutalau?
- What is Mucuna?
- Learners participate in a Code of Harvesting Practice inquiry. This provides a good learning opportunity to interview villages about how they implement the Code.



ECOSYSTEMS FUNCTIONS AND SERVICES IN NIUE

Forests and reefs are two predominant ecosystem types on Niue. Forests are considered as one of Niue’s primary natural resources offering a range of functions and services often determined by the dominant tree species within the forest. Forests harbour a wide range of plant and fauna species, stabilize soils, sequester carbon and protect water resources. Reefs constitute an important feature of the Niuean environment and they provide a vast array of ecosystem services ranging from food production to tourism earnings. The impact of forests and reefs on biodiversity, carbon and nutrient storage, water quality and quantity, soil conservation, forage production, and in addition to their recreational importance cannot be underestimated.

Ecosystem services are the direct and indirect contributions of ecosystems to human well-being supporting human survival and quality of life. Ecosystem services from the Niuean terrestrial, coastal and marine environment are summarized in Figure 4.

<p>SUPPORTING</p> <p>Nutrient cycling: Natural processes, especially water, serve as agents for nutrient cycling; plants capture and store nutrients temporarily Soil formation: Ecosystem processes generate and preserve soils and renew their fertility Primary production: Forests and reefs serve as the basis of the food chain</p>		
<p>PROVISIONING</p> <p>Food: Small-scale agricultural land, forests and reefs provide food directly or indirectly by providing forage for other species which in turn serve as food for humans Fresh water: Freshwater lens provides source of drinking water Wood and fibre: Forests, carefully managed for sustainability, provide wood and other traditional materials Medicine: Forests provide traditional medicinal herbs and remedies Habitat: Forests provide habitat for bird, insect and reptile species; reefs provide a nursery environment and habitat to a range of marine life Biodiversity: natural ecosystems maintain the viability of gene-pools, and biological diversity; natural agents disperse seeds</p>	<p>REGULATING</p> <p>Climate regulation: Forests and other vegetation sequester CO₂, moderate weather extremes and impacts, and contribute to climate stability Flood regulation: Vegetative land cover soaks up rainwater and mitigates flood events and run-off Water purification: Riparian vegetation filters nutrients and other impurities from storm run-off water, providing waste management and detoxification</p> <p>Erosion control: Forests and other vegetation bind soil and prevent erosion Pest control: Birds control insect pests; some plants inhibit plant pests; natural systems regulate disease- carrying organisms</p>	<p>CULTURAL</p> <p>Aesthetic: Forests, the coastal fringe, reefs and other natural ecosystems provide a pleasing and appealing environment Spiritual: Natural landscapes are mystical and inspirational. Tapu areas are places sacred to Niue peoples in the traditional, spiritual, religious, ritual or mythological sense</p> <p>Educational: Natural ecosystems serve as outdoor teaching laboratories; they provide for intellectual development Recreational and tourism: The coast, reefs, forests and various land formations provide opportunities for swimming, diving, hiking and other outdoor pursuits, bringing an economic return from tourism</p>

Figure 4. Ecosystem services on Niue Island and surrounding marine areas

TEACHING AND LEARNING OPPORTUNITIES

Older students will enjoy learning about Niue ecosystems. An ecosystem is a community of living organisms in that area.

THE THREAT OF ENVIRONMENTAL DEGRADATION

The unique Niue environment, its biodiversity and its ecosystem services on which life on the Island depends is under threat from both natural as well as anthropogenic impacts. The small size of Niue Island and the small population create a natural instability, common to many small island environments. Natural disasters such as cyclones can devastate a very high proportion of the land area, and introduced animals or plants may rapidly become pests in an environment of relatively few native species, which cannot provide a counter-balance.

In Niue, the ownership of land and understanding of the land tenure system must be foremost in any efforts to protect and manage the environment, and this has created difficulties in the past particularly as a result of many absentee owners residing in New Zealand and Australia. Traditional mores and customary principles of shared ownership need to be respected and this has created barriers in some instances.

There is a perception among Niue peoples that traditional forms of conservation can address environmental concerns. However, this does not always work. Outside influences and economic pressures have led to an over-exploitation of some resources and the targets of high tourist numbers can exacerbate these pressures if not carefully controlled.

Although Niue has been more fortunate than many countries in that it has lost few species and retains large areas of relatively pristine natural habitats, the threats are there and the impacts are likely to increase if nothing is done. Notable among these are examples of land degradation, the degradation of habitats and the over-exploitation of desirable species.

Systematic management of natural resources is not well developed and there are few mechanisms to prevent over-use. The legal framework and procedures are mainly in place but implementation and enforcement are weak due to a shortage of human resources. Capacity, in terms of know-how, is available, although graduates need to be lured back to maintain the level of expertise. However, the small number of people means that the “catchment” is small.

These threats to environmental values of national and global importance will have dire consequences if not adequately addressed. Prominent among these are: reduced tourism earnings, pollution of groundwater, erosion and loss of scarce topsoil, reduced ecosystem services and loss of productive land. In turn, these consequences will give rise to long term impacts such as economic downturn, loss of biodiversity, reduced incomes and depressed welfare and livelihoods. It is obvious that the threats need to be addressed.

TEACHING AND LEARNING OPPORTUNITIES

- What environmental challenges and opportunities is Niue facing and why?

THE GOVERNMENT'S RESPONSE

These are key activities that the Government has undertaken in relation to making policies and regulations.

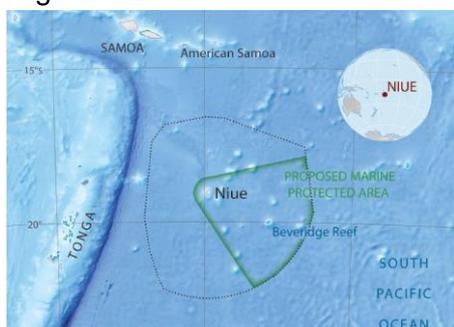
Biodiversity monitoring, conservation and sustainable use

Niue has created two protected areas, namely Huvalu Conservation Area (IUCN Category VI) and Hakupu Heritage and Cultural Park (IUCN Category III).

The Huvalu Conservation Area was established in 1992. The land area is approximately 54 km on the eastern side of the island. It includes an area of reef flat about 15 to 20 m from high tide mark. Huvalu consists of a sacred Tapu area, a primary forest and a buffer zone. The Hakupu Heritage and Cultural Park extends south from the Tuhia Access Track that was initiated by members of the family owning the land. Its primary objective is to protect areas of historical and ecological significance, including caves used traditionally for burials and others where women of the village traditionally undertook weaving, as well as fortress sites identified as ancestral dwellings, as well as a peka sanctuary. This is 23% of the area.

There are two marine protected areas, the Anono Marine Reserve, formerly known as Namoui (IUCN Category VI) and Alofi North Temporary Closed Area (which has since been reopened). The marine ones cover a very small area of Niue's EEZ (23.45 ha over 31 million ha). In addition, there are other small areas that have been traditionally defined as strict protection zones (tapu) or subject to seasonal closures. Although still practised, these are in danger of dying due to lack of formal recognition by government.

The government has also closed some marine areas from fishing, such as the Beveridge submerged reef



where Regulations provide for the protection of the "Beveridge Reef Designated Fishery" such that *no person shall knowingly destroy or damage a reef within the Beveridge Reef Designated Fishery except with and in accordance with the approval of an authorized officer*. In other areas the government is promoting management and development of pelagic fisheries (tuna and associated species) guided by a new "Niue Pelagic Management and Development plan (2012)". The overall thrust of the plan is to take an Ecosystem-based Approach to Fisheries Management (EAFM) that has a broader

focus than simply that on the sustainability of target species and takes into consideration the interactions that the fishery has on other sectors and the wider ecosystem.

Some reef monitoring activities are also undertaken. Under the business-as usual scenario, the funding available under this baseline program will not be sufficient to expand the protected area estate and cannot result in the integration of existing PAs and tapu areas into a single and continuous terrestrial conservation area.

TEACHING AND LEARNING OPPORTUNITIES

- What actions has the Government taken?
- What are the learners views on these actions?
- A good opportunity to introduce a simulated activity for older students. Imagine if you had the opportunity to influence the Government. What actions would you take and how would you go about it?

Management of waste

The Government of Niue, through the Department of Environment is responsible for Niue's Waste Management. Solid waste from households is collected twice weekly free of charge by a Contractor.

There are a number of designated dumpsites around the Island and the Department of Environment is responsible for ensuring these are managed properly to minimise negative impact.

The Department is also responsible for collecting and disposing wastewater from septic tanks. Wastewater is disposed in designated areas to avoid contamination of the underground freshwater. Options to address other types of waste such as health-waste, electronic waste and other scrap metals are reflected in the Niue Waste Management Plan. Work has been restricted by funding constraints.

Water and land management

The government has identified key boreholes in the country and has developed regulations to safeguard water quality. For example, a certain area around each borehole is protected to prevent pollution of these sites. The actual area depends on the purpose of the borehole and the prescribed distances range from a 50 m radius to a full 100 m. The Health Department tests the water quality at residential homes every three months.

In terms of sustainable land use, the government has supported the promotion of organic farming of noni and vanilla to avoid land contamination. Currently, 60 (22 female and 38 male) farmers are involved in certified organic farming covering around 633 ha of land. The government is also supporting the promotion of vegetable and fruit production by farmers through the provision of seeds, planting materials and technical advice. Moreover, the use of soil and water management techniques, such as the use of nitrogen-fixing crops as green manure/ mulch, has also been promoted by the government.

TEACHING AND LEARNING OPPORTUNITIES

- The management of waste and water and land management are popular topics for learners and provides a good inquiry focus.



The institutional response

There are direct and indirect institutional responses to the changing environment. Most of this information could be made available to high school students to examine through an inquiry.

In the current Niue National Strategic Plan Pillar 5 is about Natural Resources, Environment & Climate Change and its vision is – Sustainable Use and Management of Niue’s Natural Resources and Environment for Present and Future Generations. All the strategies under this Pillar are of relevance to this project, as follows:

Environment	Administer the Environment Act to ensure the threats to Niue’s pristine natural environment, fauna and flora species and natural resources are minimised, preserve and/or conserve.
Agriculture	Ensure the sustainable use and management of the land, soil, and animals and plant genetic resources
Fisheries/Marine Resources	Enhanced sustainable management and conservation of the marine resources
Climate Change ,Disaster Management and Risk Reduction	Ensure the adverse effects of climate change and natural hazards are mitigated and appropriate adaptation programs are implemented to strengthen Niue’s resilience.
Solid and Hazardous Water and Pollution	Review and strengthen the implementation of national initiatives in addressing solid and hazardous waste including marine pollution
Biodiversity Conservation	Conserve marine, freshwater and terrestrial biodiversity and ecosystems with the view of establishing or declaring protected or conservation areas to safeguard biodiversity and natural habitats of iconic marine and land species.
Education for Environment and Sustainable Development	Strengthen public awareness on environment, climate change, disaster management and sustainable development principles usage and practices.
Forestry	Protect, manage and conserve the forest

The **Environment Act** was passed in 2003. Its main purpose is to “allow for the development of environmental policy and law, to establish an Environment Department and to provide enforcement powers to environmental officers.”

It gives provision for cabinet to allow for the development of regulations in relation to “planning and natural resource management, waste management and pollution control, regulation of hazardous substances and waste, protection of certain species and habitat, to prescribe rules for the introduction and control of alien or non-native species, protection, preservation and management of historic areas and rehabilitation of any contaminated or polluted land.” The Act binds with the Water Act to “devise issuances of permits and license for pollution control for the protection of the water lens from contamination.”

A new **Environment Act**, which is still before Parliament, will replace the 2003 Act. It gives provision to require development consent for activities which may have a significant environmental impact. An environmental impact assessment (EIA) of the activity must be carried out as part of the process of obtaining development consent. Land use and disposing of waste and other matter as well as protection and establishment of tapu areas must satisfy environment standards to commence or continue.

Activities for which development consent is always required include among others: extraction of minerals, aggregate stones, shingle, sand, reef mud or beach rock; commercial manufacturing of paper, pulp and dry wood products; operation of a resort, hotel, motel, guesthouse, or other premises for commercial gain; use

of land or building, or both, as a golf course; use of land or buildings, or both, as a recreational park; logging operations, removal of primary or secondary forest or primary vegetation; landfills; recycling or collection stations; soil, erosion control activities; mining; reservoir developments; settlements and resettlement projects; sea projects etc. Activities for which development consent is not required include: construction; maintenance; renovation or extension of a private home in a residential area; scrub or bush clearing in relation to a private home if clearing is less than an acre.

The **Environment Regulations** outline the application process and conditions for development consents and also what is involved in the Environmental Impact Assessment Process. The Regulations also outline how the applications are processed by the Director of the Department of Environment.

The **Water Act** was passed by the Niue Assembly in 2012. The objective of the Act is “to provide an administrative and regulatory framework for the sustainable, efficient and coordinated development, extraction, protection, management and use of the water resources of Niue for the benefit of both present and future generations”. Areas guided by the Act include sustainable and efficient management and development of water resources, prevention and control of pollution of water and improving awareness and understanding of water issues. The Act outlines in conjunction with the Environment Act the conditions and process of applying for a water pollution control licence for activities such as food, livestock or agricultural processing; timber milling; waste collection and disposal sites and facilities; sewage treatment and conveyance or disposal operations; tourism operations of more than 10 beds among others.

The **National Coastal Management and Development Plan** is in its final draft stages. Its goals are to improve the productivity of coastal fisheries and to optimise the overall sustainable benefit to Niue. The plan guides the management and development of Niue’s coastal fisheries resources and habitats. It becomes effective from the date approved by cabinet and will be implemented over a period of five years. The plan is an outcome of consultations with key stakeholders such as the Village Councils and the Vaka and Fishing associations. Coastal fisheries are an integral part of Niue life in terms of traditional values, food security, income generation and community wellbeing. A large proportion of the people rely on coastal resources for their livelihoods. The plan thus takes into account the need to balance conserving the resources for future generations and using these resources now for daily needs. Traditional methods and knowledge along with contemporary management approaches will be important management tools to ensure productivity and sustainability of Niue’s coastal resources in the face of increasing modern pressures and extreme climatic events.

At the end of 2013, the Government took a new approach to realising its aspirations by grouping departments with similar objectives into two Agencies and three Ministries. They are the Central and Commercial Agencies and the Ministries of Social Services, Natural Resources, and Infrastructure. This new functional structure was decided on the basis of addressing the small human capacity to fulfil the goals of the strategic plan. It was envisioned that sharing of capacities would ensure results are achieved and operations are run smoothly. One notable improvement of the transformation is that the portfolio of the Secretary to Government is reduced to five sectors whereas previously the role was responsible for seventeen departments. Each of the ministries has a Director General who is responsible for the departments within the ministry. The Central and Commercial Agencies continue to be run by directors who report to the Minister responsible for their portfolios.

The **Tāoga Niue Act 2012** has several purposes which include the establishment of the Department of Tāoga Niue as a department of the Government responsible of coordinating all matters relating to Tāoga Niue. An expert advisory council to the department was also established as a provision of the Act. Other

requirements from the Act include control of the export of antiquities and objects of national historical and cultural significance; protection of traditional knowledge and expressions of culture. Niue's cultural and traditional practices and knowledge prior to the establishment of the department were in danger of disappearing due to total reliance on verbal documentation. The department, despite its lack of resources to effectively achieve its objectives, is an adequate mechanism to address the key priorities and protect and maintain the use of the Niue heritage.

The introduction of the **Policy for Gender Equality** is an important milestone for a small island state that is Niue. There is recognition that gender inequality exists at the national and local level and many gender gaps can degrade the functionality of social, economic, political and environmental systems among others. The policy mission is "to strengthen mechanisms and create conditions to eliminate gender inequalities and for addressing the needs of both women and men in all aspects of Niueans' private and public life." The policy's goal is to "strengthen equal rights and equal opportunities for all women and men to use their full potential to participate in the economic, social, political and cultural development of Niue." The development of this policy indicates Niue has taken a significant step towards realising the improvement of the quality of life in Niue comes from recognising differing roles of men and women in society and in their private homes.

In 1998 Niue carried out a **Land Use Planning** project, funded by AusAID and lasting three years with a budget of around USD318,000. The project results included the development of a GIS database including an aerial photograph montage (primarily using 1960s photographs) geotagged to the cadastral base, satellite imagery overlay (using 1990s Landsat imagery), mapping of bush tracks with GPS, identification of special geological sites (caves, burial grounds, traditional water gathering sites, etc), GPS mapping of infrastructure (including water pipes, telecommunication facilities, power cables, etc). The project also captured a lot of traditional knowledge, digitised this into a database on each village and developed Local Area Plans for all villages.

Sustainable Development Guidelines were also produced including proposed energy efficient designs, cyclone sensitive design and planning, traditional and customary sensitive design, etc. Several plans were also produced for development of specific proposals at the time including maps and guidelines for the relocation of the bulk fuel depot, assessment of a proposed tourism development and the location of wind turbines. Wave inundation maps were also produced with both historic and traditional knowledge digitised maps. An important part of this work was considered at the time to be the development of sound economic plans irrespective of land title to help overcome some of the land tenure problems. Town planning was applied to the main "urban" area of Alofi and planning guidelines developed for access to property, etc. Some of these results have not survived the passage of time and even those that have are completely out of date, particularly as a result of Cyclone Heta. There is a need to rebuild the land use planning capacity.

Land ownership is through the Land Act and involves mainly the titling process carried out through the Justice Department and in addition to building on the results of the Land Use Planning Project described above, the R2R project will work in consultation with the Justice Department centrally and through Village Councils and the Church at community level.

Finally, it is important to acknowledge the 14 Village Councils set up by the Village Councils Ordinance 1967 and which in Niue play an important role in the protection and management of biodiversity and the environment. Village Councils have broad powers, including conducting business enterprises, improving housing standards, promoting agricultural and fisheries enterprises and cooperating with the Government to provide social services. To deliver these functions, Councils are empowered to make by-laws and to levy taxes. These provisions are relevant to the recognition of traditions, culture and traditional authority.

In 2008, Village Councils were given the opportunity to develop Village Plans and two villages, namely Tuapa and Hakupu accepted the challenge and developed plans. The Tuapa Plan³⁶ was produced as part of a UNDP sub-regional programme covering four South Pacific Countries: Cook Islands, Niue, Samoa and Tokelau. The overall objective of the plan is to strengthen the Tuapa community's capacity to drive the planning and implementation of their own sustainable development priorities towards achieving the Millennium Development Goals (MDGs) by 2015, taking into account human rights approaches and gender issues. There is no mention of environment, biodiversity or natural resources in the plan and this is an area where this project will be able to assist villages with the review of existing plans (for Tuapa and Hakupu) or the formulation of new plans (for the rest of the 12 villages).

TEACHING AND LEARNING OPPORTUNITIES

- What actions has the Government taken?
- What are the learners views on these actions?
- How well are they implemented?
- What would they change?



REMAINING CHALLENGES AND OUTSTANDING GAPS

Despite the significant government response to the identified threats, gaps remain and barriers stand in the way of further progress and the achievement of sustainability – these are placing Niue’s biodiversity and environment at risk.

Research and consultations at the concept phase identified **six existing impacts and remaining threats** to biodiversity and natural resources of national and global significance.

Unsustainable harvesting of wild resources

One of the key threats to Niue’s biodiversity is the unsustainable harvesting of wild species. The hunting of flying foxes (*Pteropus tonganus*) and the Pacific pigeon (*Ducula pacifica*) is a Niuean tradition which is managed through the operation of a closed season. However, although hunting is formally disallowed outside the hunting season (typically December-January), shooting is observed and this is thought to be contributing to a decline of these species. Similarly, over-harvesting of the coconut crab (*Birgus latro*) has been noted as a particular concern in the country.

In the marine environment, un-ecological fishing methods, such as using poison, are indiscriminate and lead to the destruction of non-target species and also undersized individuals of the target species. In addition, the death of coral and seaweeds has been reported following the use of such poison³⁷ although it is also noted that the practice of using poison is considered to be in decline. Local communities have also noted an impact on fisheries and coral damage from the use of non-traditional fishing methods (e.g. use of hammers, axes, and crowbars) when reef gleaning or through the use of small-sized nets for trawling. Reports from local divers suggest that giant clam species are in danger of becoming extinct. Local women who frequently glean or fish on the reef flats are concerned about the rarity of *Caulerpa* spp compared to decades ago. Baseline surveys indicate that non-protected reef flats on the southwestern part of the island showed very low species diversity for both invertebrates and corals compared to a protected area of relatively the same size.

Land Degradation

Over the 30 years since 1966, 22% of the indigenous forest cover has been lost in Niue³⁸ through conversion to agricultural production. Although the soils of Niue tend to be moderately fertile, they are very shallow and only 60% of the island’s land area is suitable for agriculture. The potential is further limited by the lack of running water and irrigation facilities, and by the small number of aging farmers in the island. Deforestation has occurred on the more fertile soils and less so on thin soils or soils with a large proportion of coral outcrops as these areas are deemed unsuitable for agriculture. Construction of new roads for logging operations could potentially open up more forest for hunting and agricultural activity which would create a negative impact on the conservation of forest values.

Traditional ‘slash and burn’ cropping techniques are still practiced, but in recent years this method has been gradually replaced by the use of bulldozers for land clearance. Disc ploughing is considered the largest single contributor to loss of soil structure and fertility decline in the 1950s and 1960s.

On the positive side, garden areas are usually left to fallow for up to 10 years before being cultivated again and composted materials are added to the soil to facilitate rejuvenation.³⁹

The result of all this is that much of the island is now a mosaic of varying stages of regeneration interspersed with cultivated gardens.

Pollution

Increasing household waste, agricultural chemical use (inorganic fertilisers, weed killers) and oil spillage from boats are some of the key pollution sources of land and water in Niue. The study of coastal water quality by SOPAC⁴⁰ in 2003 showed that there was high nitrate and phosphate concentration in some coastal areas through seepage of effluent from domestic septic tanks draining into the groundwater and coastal areas. This is thought to be resulting in toxicity and destruction of fish in such areas. Domestic and all other solid waste is disposed of in an open dump which, while controlled, is not adequately managed and poses a threat to the freshwater aquifer.

Groundwater quality

The groundwater lens is considered highly vulnerable to land activities due to the highly permeable nature of the coral rock with infiltration from surface to groundwater taking place rapidly within 1-2 days. The likelihood of contamination of groundwater is now much higher than it used to be due to the relocation of households and government buildings and the location of piggery and poultry farms in the water catchment and the proximity of onsite treatment systems to groundwater supply bores. As a result of the higher nitrate concentrations around Alofi and the confirmation of the high vulnerability to groundwater contamination⁴¹, there are now calls to relocate supply bores further inland and to employ best practice in waste treatment. Indirect water seepage and direct sewage discharge has also affected coastal water quality and the threat is increasing.

Invasive alien species

The global invasive species database has noted around 60 invasive species in Niue⁴², including 13 tree species, vines/creepers such as *Micania micrantha*, and three different species of rats. Although the impacts of such invasive species on native species and ecosystems have not been fully documented, they are considered to be negative and significant. The METT carried out under the *PAS: Forestry and Protected Area Management* Project indicated that invasive non-native/alien plants (weeds) and invasive non-native/alien animals comprise medium threats to Niue biodiversity and native ecosystems. The recently completed National Invasive Species Strategy and Action Plan identified the actions needed to address the threats posed by invasive species.

Climate change

Predicted global climate change will have a number of impacts on Niue. These include increases in average temperatures of both the atmosphere and the sea surface, reduction in the amount of dry season rainfall and an increase in the extreme rainfall events in all seasons, and increases in wind speed, particularly in the dry season. The El Nino Southern Oscillations (ENSO) are expected to further compound climate change impacts, since Niue is located under the typical movement of the South Pacific Convergence Zone (SPCZ), which causes droughts during severe El Nino years. There are also predictions that changes in the global climate will result in more frequent and more intense storms and cyclones, which can cause major damage to the country's infrastructure and natural resources (forests and coral reefs). Tropical Cyclone Heta (category 5 storm) in 2004 caused peak wind gusts of 296 km/hour, and waves in excess of 50 meters in height and this caused major damage to Niue, including its forests and coral reefs; it uprooted trees and wildlife were destroyed directly as well as from starvation following the loss of habitats. A survey following Cyclone Heta found that several invasive species already present on the island, exhibited opportunistic behaviour and expanded their range and abundance after the cyclone.

BARRIERS TO OVERCOMING ENVIRONMENTAL DEGRADATION

Research during the project concept phase found that efforts to overcome environmental impacts and threats were hindered by two barriers in particular and that these would stand in the way of any effort to address these impacts and threats. As a result, the project will work towards overcoming the identified two barriers and each of these is discussed in turn below.

Barrier 1: Limited capacities and mechanisms for management on an integrated landscape and seascape scale

The values of biodiversity resources in Niue have not been properly documented. Whilst basic economic values (such as use of wild resources for food, the provision of water, tourism values from nature, etc) are known, they have not been comprehensively documented. Additionally, the analysis of the value of the island's biodiversity or its marine biodiversity has not been updated regularly. Information on biodiversity status and hotspots are currently unavailable. Furthermore, social and cultural values of nature, reflected in traditional knowledge, folklore, and handicraft production related to biodiversity, are being lost. This can be explained by the interrupted transfer of these values from the older generation to younger ones due to emigration.

The lack of analysis and documentation of values is largely due to the limited capacities and involvement of different government departments and communities in ecosystems management. There is an emerging recognition by different sectors (such as education, culture, water resources management, community development) of the relevance of their work for ecosystems management and of ecosystems to their priorities, but limited capacities and awareness on such linkages has hampered effective mainstreaming of environmental issues in their work. This has led to a fragmented sectoral approach to resources management by different sectors without clear cross- agency cooperation and partnerships. This has meant that the desired positive impacts on the environment have not been achieved as the possible synergies that exist between different sectors have not been realized. It should also be noted that the inclusion of communities is important for the realization of an integrated approach as the new terrestrial PA will contain seven Tapu areas.

Furthermore, social and cultural values may complement economic values and inclusion will assure a more holistic approach. Moreover, the promotion of sustainable activities in the areas surrounding the continuous conservation area is necessary to reduce the threats from outside.

Another constraint to local capacity to deliver efficient and effective development programmes is the low population of Niue. In this connection it should be noted that smaller populations possibly lead to lower environmental pressures (e.g. unsustainable farming and deforestation) leading to a reduced need for remedial or protective measures. However, the thrust towards tourism would mean increasing the number of island inhabitants from the tourists and the necessary support workers, possibly migrants. As the socioeconomic conditions in Niue further improve, it is also conceivable that Niue peoples from abroad return to the Island. All these could add pressure on the island's ecosystem.

Barrier 2: Limited integration of terrestrial and marine biodiversity conservation into government and community plans and actions

As noted in the PIF, most of the land resources of Niue are vested in extended families, under the stewardship of the family appointed *Levekis*. Therefore, any creation of protected areas on land needs to be consented by the families and enforced primarily by them. The current approach to developing community sustainable development plans has not included any focus on natural resources management or heritage protection. The traditional practice of setting aside strict protection areas (*Tapu*) or seasonal

closures (*Fono*), although still practiced, is in danger of dying out as it has not been formally supported by the government. Such areas, particularly terrestrial *Tapu* areas, are of relatively small size for them to effectively conserve important areas on their own, and if the wider surrounding areas around them are degraded or mismanaged, then the integrity of the *Tapu* areas themselves is likely to be jeopardized. In addition, related to Barrier 1 above, local communities have not recognized fully the benefits of conservation actions on their lives and livelihoods and the threats to both marine and terrestrial biodiversity posed by pollution and unsustainable use. Marine areas, in particular, have received less attention for conservation efforts.

Communities have been setting aside land and reef areas for permanent or periodic closures; but these areas have been of too small a size to effectively conserve important global biodiversity in Niue. This is especially so in the case of the wider surrounding areas which have continued to be degraded or mismanaged, through overharvesting of resources (such as flying foxes and coconut crabs) and land conversion (for agriculture). Such community set-aside areas have also not been given formal legal designation as protected ecosystems. Additionally, current conservation initiatives have not been implemented in a holistic manner (the ridge to reef approach). Whilst basic economic values (such as use of wild resources for food, the provision of water, tourism values from nature, etc) are known, the full values of ecosystems in terms of biodiversity values and cultural values have not been documented, thus the current PAs have not fully incorporated multiple values of the ecosystems in Niue. This issue is particularly relevant to Niue as almost all land areas are owned by local families.

TEACHING AND LEARNING OPPORTUNITIES

- How can students help communicate key messages?
- What are they?
- In what ways can you revisit some of this information so key messages become part of your classroom?



