WIAWI

COMMUNITY TURTLE MANAGEMENT PLAN 2025

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Green Turtle swimming in the ocean. Credit: Freepik.

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Green turtle swimming in the sea. Credit: Freepik

Approval

Wiawi Community Sea Turtle Management Plan for the protection and sustainable management of sea turtles in Wiawi conservation Area, North West Malekula Island.

By virtue of power conferred upon the people and community of Wiawi Community, under section 5 of this plan, we the people of Wiawi Village represented by our chiefs and Chairman of North West Area Council hereby approve of this Community Turtle Management Plan.

Chief, Wiawi Community:

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Chairman, North West Area Council:

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Mifala i saenem pepa ia long dei ia: 16/JUNE/2025

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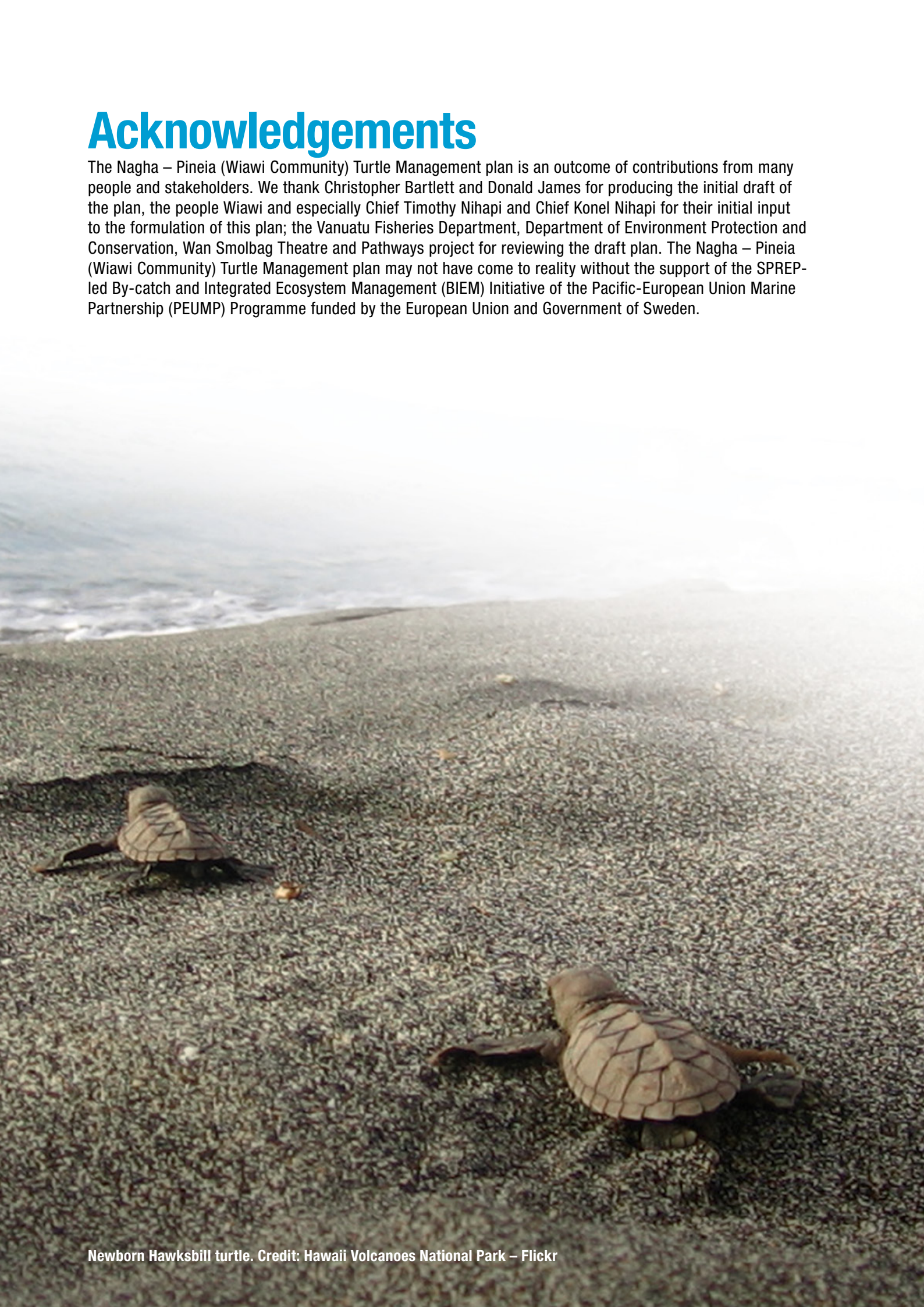
The Nagha – Pineia (Wiawi Community) Turtle Management plan is an outcome of contributions from many people and stakeholders. We thank Christopher Bartlett and Donald James for producing the initial draft of the plan, the people Wiawi and especially Chief Timothy Nihapi and Chief Konel Nihapi for their initial input to the formulation of this plan; the Vanuatu Fisheries Department, Department of Environment Protection and Conservation, Wan Smolbag Theatre and Pathways project for reviewing the draft plan. The Nagha – Pineia (Wiawi Community) Turtle Management plan may not have come to reality without the support of the SPREP-led By-catch and Integrated Ecosystem Management (BIEM) Initiative of the Pacific-European Union Marine Partnership (PEUMP) Programme funded by the European Union and Government of Sweden.



Newborn Hawksbill turtle. Credit: Hawaii Volcanoes National Park – Flickr

1. Introduction

Wiawi is an important turtle-nesting site in Vanuatu known for hawksbill and green turtles. The significance of the area came to light after independence in the 1980s following forest conservation interests by the Forestry Department, which resulted in the setting up of the Wiawi Conservation Area. With the support of the Wan Smolbag (WSB) turtle monitoring programme in the 1990s, the community of Wiawi embarked on interventions towards strengthening sea turtle monitoring and conservation in Wiawi through the request from Chief Timothy and his brother Chief Konel Nihapi. These two community elders had worked very hard to establish the Wiawi Conservation Area and invested their time and energy to making Wiawi one of the leading community-based turtle conservation areas in the country.

The WSB turtle monitoring programme has been instrumental in promoting and supporting community turtle monitoring activities through funding support from SPREP and other projects. Data collected is channelled to WSB where it is entered into the regional turtle database managed by SPREP. As a voluntary activity, the community turtle monitoring programme has been challenging with little to no government support and declining interest. The elders of Wiawi are concerned their young generations may not continue with turtle monitoring work if the status quo remains and this could lead us back to before when turtle meat and egg were being harvested.

The Secretariat of the Regional Environment Programme (SPREP) provided support for community monitoring of endangered species under Key Result Area 5.7 of the By-catch and Integrated Ecosystem Management (BIEM) Initiative of the Pacific-European Union Marine Partnership (PEUMP) Programme funded by the European Union and the Government of Sweden. Following initial consultations in 2019, the community of Wiawi agreed to participate in the wider BIEM Initiative to develop gender and human rights sensitive integrated ecosystem management plans for their coastal areas and associated watersheds. In a follow-up baseline assessment in March 2021, the community of Wiawi reiterated their request for support for turtle monitoring work through development of a management plan as a component of the broader integrated management plans being developed for the area. At the same time, they requested support to identify activities that can be developed into ecotourism.

The purpose of the Community Turtle Management Plan (CTMP) is to improve governance and ownership of the community turtle management work and take turtle monitoring and conservation to another level following the wishes of the elders of Wiawi. During the 2021/2022 nesting season, a BIEM-funded consultant conducted consultation with the community on the development of a management plan and provided the original draft of the plan. The expert consulted with national, regional and international partners on this plan, including Vanuatu Fisheries Department (VFD), Department of Environmental Protection and Conservation (DEPC), community stakeholders, technical experts including IUCN Marine Turtle Specialist Group (MTSG), Vanuatai Risos Monitors, local NGOs, SPREP's Threatened and Migratory Species Adviser and the BIEM By-catch/CITES Coordinator from TierraMar.

A draft of the plan was taken back to the community in June 2024 and the community reviewed the draft and provided their inputs. This Wiawi CTMP has been fully determined by the Wiawi traditional landowners following extensive consultation undertaken in the 2021/2022 nesting season. This plan will inform the wider consultation exercise to determine whether the community wishes the integrated ecosystem management plans for the wider coastal areas and associated watersheds to be formalised as a Community Conservation Area.

2. Purpose and scope

Figure 1. Management plan consultation June 2024

The people of Wiawi community are passionate about turtles and have been undertaking turtle monitoring on a voluntary basis for many years. From this focus on conservation, they have been able to have a new water supply system and many projects are interested to work with the community. With the growing threat to turtle populations globally, and pressure on the coastal environment from natural causes and human disturbances, the community desire is to have in place a CTMP in recognition of their effort but more importantly to take turtle conservation to the next level and into the future. The Wiawi CTMP is a community initiative to protect, conserve and manage sea turtles, their nests, eggs and hatchlings, their nesting habitat and interactions with humans and other animals within the customary area of Wiawi village on the northwestern side of Malekula Island. The Wiawi CTMP is the first such plan for Wiawi community. It has gone through community consultation (Figure 1) and is in line with the Environment Conservation Act, the Fisheries Act and the National Plan of Action for Seabirds, Sharks and Marine Turtles. This plan provides guidance for cooperation with other communities, partners, local and the national governments and NGOs to strengthen monitoring, management and protection of turtles and their nests to increase production of healthy juvenile turtles entering the sea every season. Specifically, the objectives for the Wiawi CTMP are to:

- Protect and maintain natural resources for the enjoyment of present and future generations in Wiawi;
- Improve the hatching success of sea turtle nests (avoid loss by predation and climate change);
- Enhance the performance and effectiveness of community Sea Turtle Monitors in Wiawi;
- Better understand the local sea turtle population – where they travel when not nesting and how often they return to nest;
- Contribute to sea turtle science and knowledge in Vanuatu, in the Pacific and at the international level.
- Build local capacity on sea turtle science and management practices;
- Strengthen local and traditional governance of natural resources;
- Build networks that link turtle resource champions across villages and islands for sharing information and collective action;
- Develop social and economic benefits flowing from healthy sea turtle populations to the local community and households; and
- Develop ecotourism attraction from tourism activity to promote wider conservation outreach, research and community livelihood opportunity.

3. Background

3.1. Wiawi community, governance and people

Wiawi is a small coastal village on the northwestern side of Malekula Island, Malampa Province in central Vanuatu. Wiawi is part of the North West Malekula Area Council whose Centre is based at Tenmaru. Access to Wiawi takes four hours by road from the township of Lakatoro (on the eastern coast of the island) to Leviamb village and Wiel. Poor road conditions make it inaccessible at times and the most common access is by boat from Labubu Bay or Unmet Bay. The population of Wiawi today is comprised of one family (the Nehapi Family) with a population of 54 people of which 52 percent are female. Wiawi village is a very small village with a few strong middle-aged people who carry out work in the village. Housing in Wiawi is constructed of local material, mainly bamboo and thatched roofing. A new water supply system in the village was installed in 2022. It also has a solar power lighting system, a primary school, and cattle ranch but is still without a proper access road.

The village is governed by two chiefs (who are brothers) representing two nakamals of "Nagha" and "Pineia", "Nagha" being the Nakamal of Wiawi village headed by Chief Konel Nihapi and "Pineia" being the Nakamal of Wilak village, the adjacent village to the north headed by Chief Timothy Nihapi. Chief Timothy Nihapi has gone through the chiefly process of a pig killing ceremony known as "Namangi" in the big Nambas custom, which accords him higher authority in the village. Both chiefs reside together in Wiawi after their return to their ancestral land in 1969 when Wiawi village was born. This has created ongoing issues of power struggles in Wiawi although not too obvious. As brothers, there is cooperation between them despite ongoing disagreements. As a small community, there is no village council but there are several committees who are in-charge of development activities which are:

- Water Committee
- Tokas (Women's Group)
- Marine Management Committee
- Icebox Committee
- Turtle Monitoring Committee.

The effectiveness of these committees varies as is usual for a small community. For instance, the Turtle Monitoring Committee exists only by name and is no longer active. Only Chief Konel and his son are committed to turtle monitoring work. As is the case for many rural communities in Vanuatu, the activities of the community of Wiawi are influenced by their traditional calendar (Table 1), which in turn is dictated by weather and climate patterns, which form the warm-wet season and cool-dry season.

Figure 2. Progression of the male through the chiefly system in Wiawi

Table 1. Key events in the Wiawi traditional calendar

Month	Traditional Activity
January	This is the time boys become young men through ceremonial activities. Time to look for food for the kitchen, rain, not much growing.
February	Fish are laying eggs.
March	Gardens begin to be cleared for new planting.
April	Dolphins and whales are active and regularly sighted.
May	Yam is ready to be harvested and many customary festivals commence.
June	Sea becomes very dry, and there are big swells and the rabbit fish (pico) are plentiful.
July	Time to plant yams again.
August	Long yams like “Tenaot” and “Nikal” are ready.
September	Very good yam harvest.
October	Newly planted yams begin to grow.
November	Rainy weather begins.
December	Lots of fruit, not much work in the gardens.

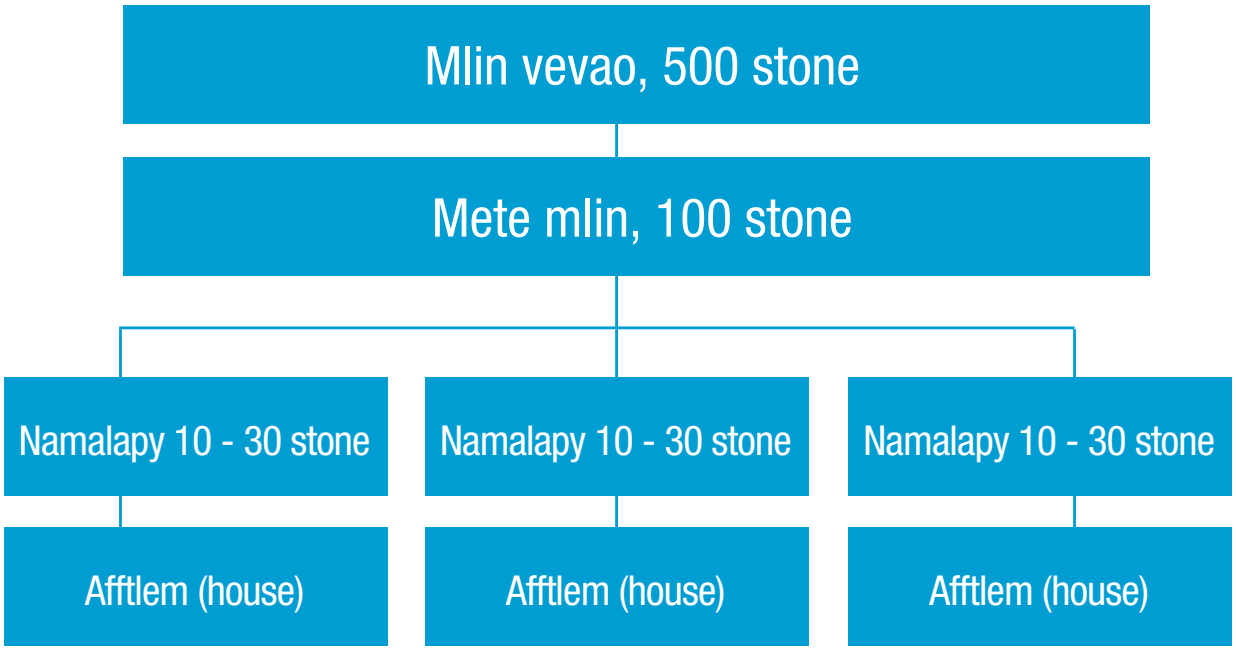


Figure 2. Progression of the male through the chiefly system in Wiawi

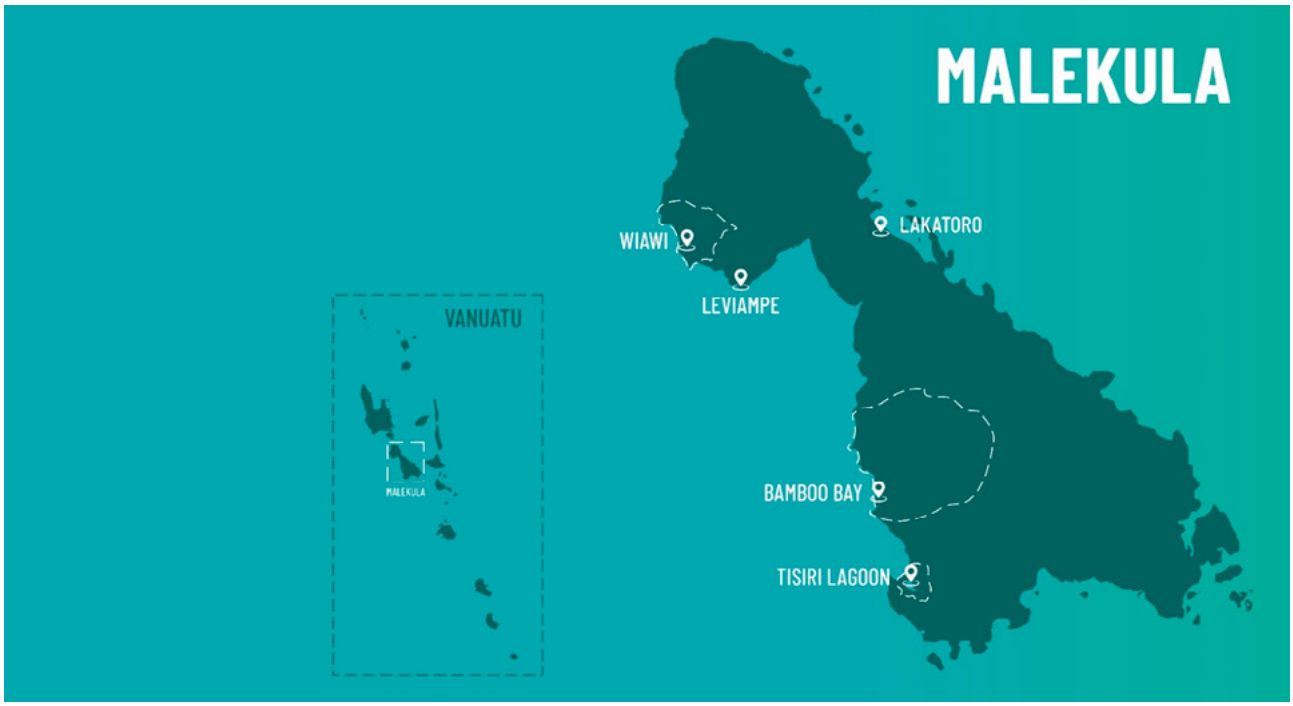
3.2 Religion and beliefs

The community of Wiawi is *Seventh Day Adventist* (SDA) who are Saturday keepers. SDA worshippers believe in certain diet restrictions on meat such as pork, flying fox, shellfish, sharks, lobster, other invertebrates, turtle meat and eggs, and coffee. This common belief for SDAs is that the people do not consume these resources as they believe that all living things in the world are God's creation and must be looked after. This belief has contributed to shaping the community conservation of their resources including all resources that are not utilised by the community members.

3.3 Origin, history and people

An old spirit woman named Ragutlil oversaw feeding the pigs. One day she found a pregnant sow was missing and understood that it had run away to give birth. She searched and called for days, but the sow did not come. Finally, she went searching, following the tracks of the sow (Ala Prapar is the name of this track, which means "pig's trail") to a stone on the beach called Ala Prapar. Seeing an offshore stone island, named Virelaoh, she deduced the sow must have swum there. She went home and returned with a bow and seven arrows. The first shot hit Virelaoh, and her second shot hit the tail of the first arrow, as did the third, fourth and so on, creating a bridge of arrows. She turned herself into a light bird, and so was able to walk across the bridge of arrows to reach Virelaoh. When she arrived, she heard a baby crying in a cave and realised that the sow had given birth not to piglets, but to a human boy. She brought the baby back across the arrow bridge and buried his umbilical cord in the sand. To this day, the people of Wiawi do not eat sows, as they are descendents of this line.

Figure 4. Map showing location of Wiawi village, northwest Malekula



Ragutlil named the baby Mlin Ahgalow and cared for him as her own child. When he came of age, she sent word to neighbouring villages that he was to become a chief and fixed the date for the Namangi (pig killing ceremony). Neighbouring villages brought all kinds of custom foods and cut special tamtam drums for the occasion. Chief Mlin Ahgalow married and had two sons: Mlin Arpnata, the first-born, was given land called Nagha, while Mlin Aphsari, second born, was given land called Pineia. Today the custom area of Wiawi is known as Nagha – Pineia). The original name of Wiawi nakamal is called "Naga" and the chief responsible is chief Konel Nihapi. The original name of the nakamal for Wilak is "Pineia" and the chief responsible is chief Timothy Nihapi. The two brothers Jif Timothy Nihabi and Jif Konel Nihapi returned to Wiawi from Portovro and Matanvat and now live together because they are few.

The people of Wiawi belong to the 'Big Nambas" tribe of northwest Malekula, one of the two main tribes of Malekula Island. The other is the "Small Nambas" tribe of central to south Malekula. Historically, the people of Wiawi village were dislocated due to intense tribal fighting and cannibalism, which caused the natives of the coastal area of Wiawi and Wilak to flee the area to the northern villages of Matanvat, Espikels Bay, Wean, and Potovro, while some moved and settled in south Santo. In their absence, the inland people moved down to the coast and settled on their land and set up new settlements such as Wiel and Wilak and claimed land and cultivated coconut plantations. In 1969, the Condominium Government of the New Hebrides awarded the original tribe their customary right to return and the village of Wiawi was born that year. The rest of the people of Wiawi have not returned to this day.

3.4 Livelihood activity

Wiawi community is rich in both upland and marine resources. The main economic activities are copra, cocoa, timber, and livestock including beef and chicken. Cacao and copra are dried and sold to a buyer in Lakatoro. Recent surges in the price of cocoa after the drop in cocoa production in Africa has seen increased cocoa production and very attractive prices around VT360,000 per tonne or VT360 per kilogramme of dry nuts. Cocoa production in Malekula and Wiawi is booming again. Copra price has not been so attractive at VT40,000 per tonne but is being produced along with cocoa beans. Virgin coconut oil, kava and paper are also being produced by farmers in Wiawi. Wiawi is in a cattle ranch area with over 50 heads, which are sold whole to surrounding villages. A small production of handicrafts such as mats, fans and baskets produced by women is sold at the Lakatoro Handicraft Centre. The challenge for the Wiawi community is access to the market. With bad road conditions, farmers carry their cocoa beans all the way to the nearest village of Leviamp on foot and by boat to Unmet Bay.

3.5 Conservation Activities

ACIAR Forestry project:

Communities in the Wiawi area have been working with partners on conservation initiatives since the 1990s. In 1995 through a Forestry project funded by the Australian Centre for International Agricultural Research (ACIAR), forest resource surveys were undertaken in Wiawi and these recommended logging development in the area; but the chiefs disagreed with logging. It is from here that the "Nagha – Pineia Conservation Area" was set up (Tacconi and Benneth 1997 [1]). The ACIAR report proposed to establish a nationally recognised conservation area in Wiawi, however, this has not progressed due to misunderstandings about the Community Conservation Areas under current legislation.

Environment Network (EN):

EN is a local NGO set up to assist communities with development of conservation area plans and implementation. EN came in to support the Wiawi community with a conservation area management plan. The plan included identifying the boundary of the conservation area, management activities for the different zones within the conservation area and for Wiawi with rules:

- Vegetation may not be subject to alteration
- Collection of firewood and other wood products is prohibited
- Fires may not be lit
- Buildings of any kind may not be erected
- Earthworks of any kind are prohibited.

Wan Smolbag Turtle Monitoring programme (WSB):

The WSB turtle monitoring programme in Wiawi started in 2004 through training of Chief Konel Nihapi, who continues to undertake monitoring work and train his son to continue this work today. Annually, the turtle monitoring officer (Mr Donald James) visits Wiawi to assist with data collection during breeding season, address any issues arising and collect the log sheets to take back to Port Vila.

1 Tacconi, L. and Bennett, J. W. 1997. Protected Area Assessment and Establishment in Vanuatu, Monographs, Australian Centre for International Agricultural Research, number 118037. DOI: 10.22004/ag.econ.118037

Marine Spatial Planning Project:
In March of 2020, Vanuatu's Marine Spatial Planning project supported baseline assessments of reef resources (MSP 2021).

Pathways Project (2020 – 2023):
The Pathways Project (2020 – 2023) funded by ACIAR also worked in Wiawi and provided support with development of a community-based fisheries management plan to promote sustainable fishing activities and improve seafood quality with donation of a solar freezer.

By-catch and Integrated Ecosystem Management (BIEM):
SPREP's By-catch and Integrated Ecosystem Management (BIEM) Initiative of the Pacific-European Union Marine Partnership (PEUMP) Programme (2022 – 2026) funded by the European Union and the Government of Sweden (this project) is building on these past efforts to strengthen the ridge to reef management. Activities undertaken under the project include a terrestrial biological rapid assessment, a marine BIORAP assessment (biological rapid assessment), an integrated ecosystem management plan, turtle management plan for Wiawi, and turtle research.

These engagements contributed positively to the community in the preservation of their environment. In summary, the followings are some of the important development activities undertaken in Wiawi:

- In 1993, a logging company was unsuccessful in its attempts to cut timber in the area due to refusal of the chiefs.
- In 2000, the Wan Smolbag Sea Turtle Programme began supporting the community.
- In 2017, a logging agent (Frank) with a walkabout sawmill successfully lobbied the community to fell some trees, although many landowners felt pressured into the agreement they did not want.
- In 2020, the government made an unpaved road through the forest from Wilak to Leviamp to the Wiawi community.
- In 2020, VFD put a solar icebox in the community and commenced catch monitoring.
- In 2020, the Office of Oceans Affairs conducted marine ecological surveys of coral, fish, invertebrates and waste in the community.
- In 2021, the South Pacific Community Development Company commenced the construction of a water supply system.

3.6 Climate and rainfall

Temperature, precipitation and tropical cyclones are factors affecting seasonal changes in the condition of the breeding habitat of sea turtles. According to the World Bank knowledge portal, Vanuatu's climate varies with latitude. It is wet tropical in the northern islands, which receive over 4,000 mm of annual rainfall and dryer sub-tropical further south, with annual average rainfall of 1,500 mm. Average temperatures range from 21°C to 27°C and seasonal temperatures in Port Vila exhibit high variability. Summertime temperatures exceed 30°C and minimum temperatures often reach below 20°C (The World Bank 2019). Seasonal and interannual variations in climate are driven by changes associated with El Niño, which affect every aspect of the climate in the Pacific. Cyclones are common in Vanuatu during the warm months of November to April, although two recent cyclonic events were experienced outside of the traditional cyclonic season. Figure 5 and Figure 6 present historical records for temperature and precipitation for Malampa Province. The charts are extracted from the Climate Change Knowledge Portal (The World Bank 2019[2]).

A list of natural disasters that have affected the people of Wiawi are:

- In 1995, a prolonged dry season killed many crops and bush fires broke out, burning coconut plantations.
- In 2002, Cyclone Ola affected gardens and plantations.
- In 2011, a small tsunami affected Nambar and brought the sea beyond its normal level.

2 The World Bank. 2019. The Climate Change Knowledge Portal. https://climateknowledgeportal.worldbank.org/country/vanuatu/climate-data-historical

- In 2015, the El Nino dry season caused substantial loss of crops.
- In 2015, Cyclone Pam affected forest and gardens and houses.
- In 2019, there was a prolonged drought, water was scarce. Bamboo stands caught fire in two places.
- In 2020, Cyclone Harold caused some damage to gardens.
- In July 2021, there was a strong earthquake although there was no damage, as well as a prolonged dry season.
- In 2023, Cyclone Judy and Cyclone Kevin caused damage to gardens and forest resources.

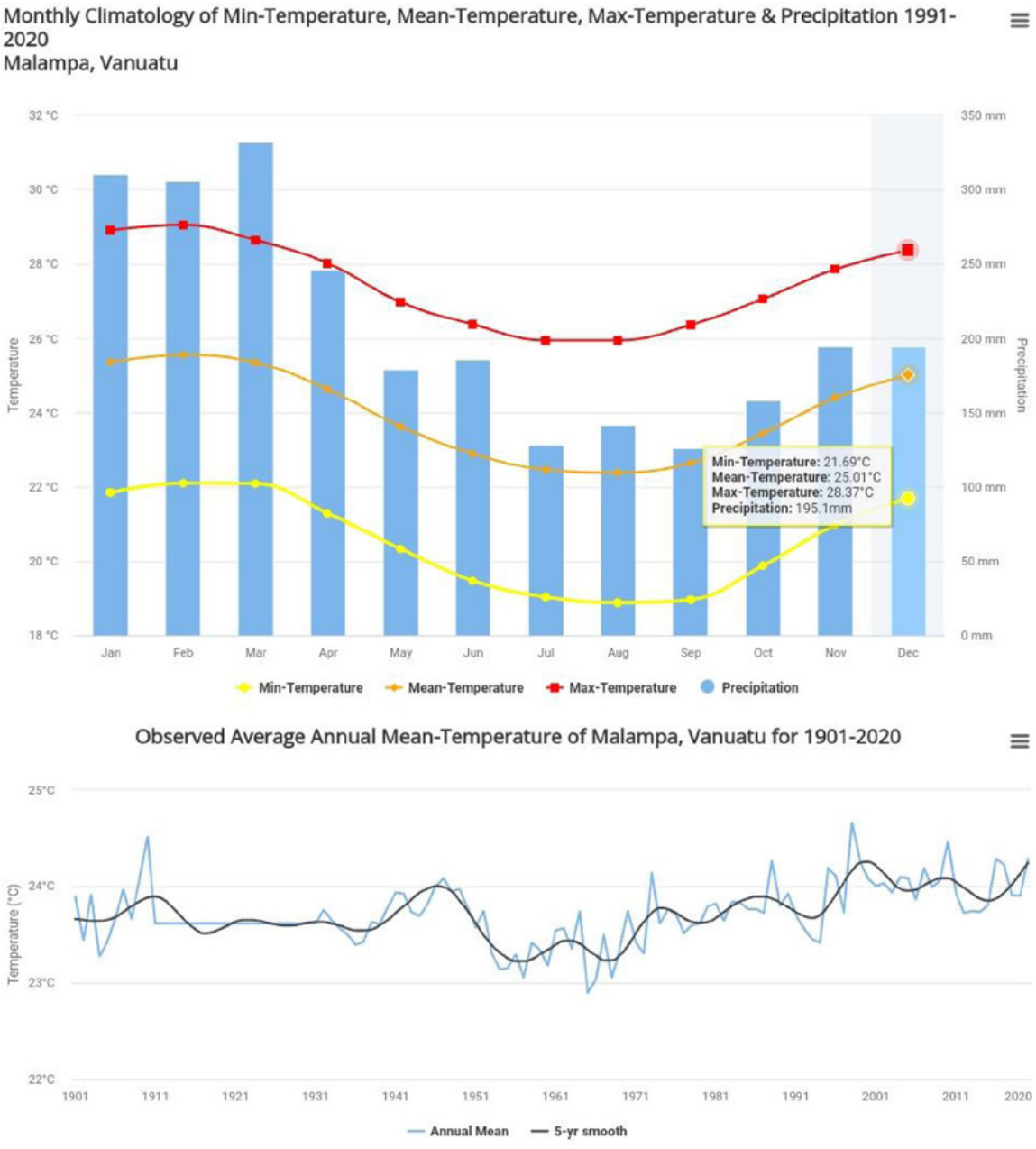


Figure 5. Historical record of temperatures and precipitation for Malekula

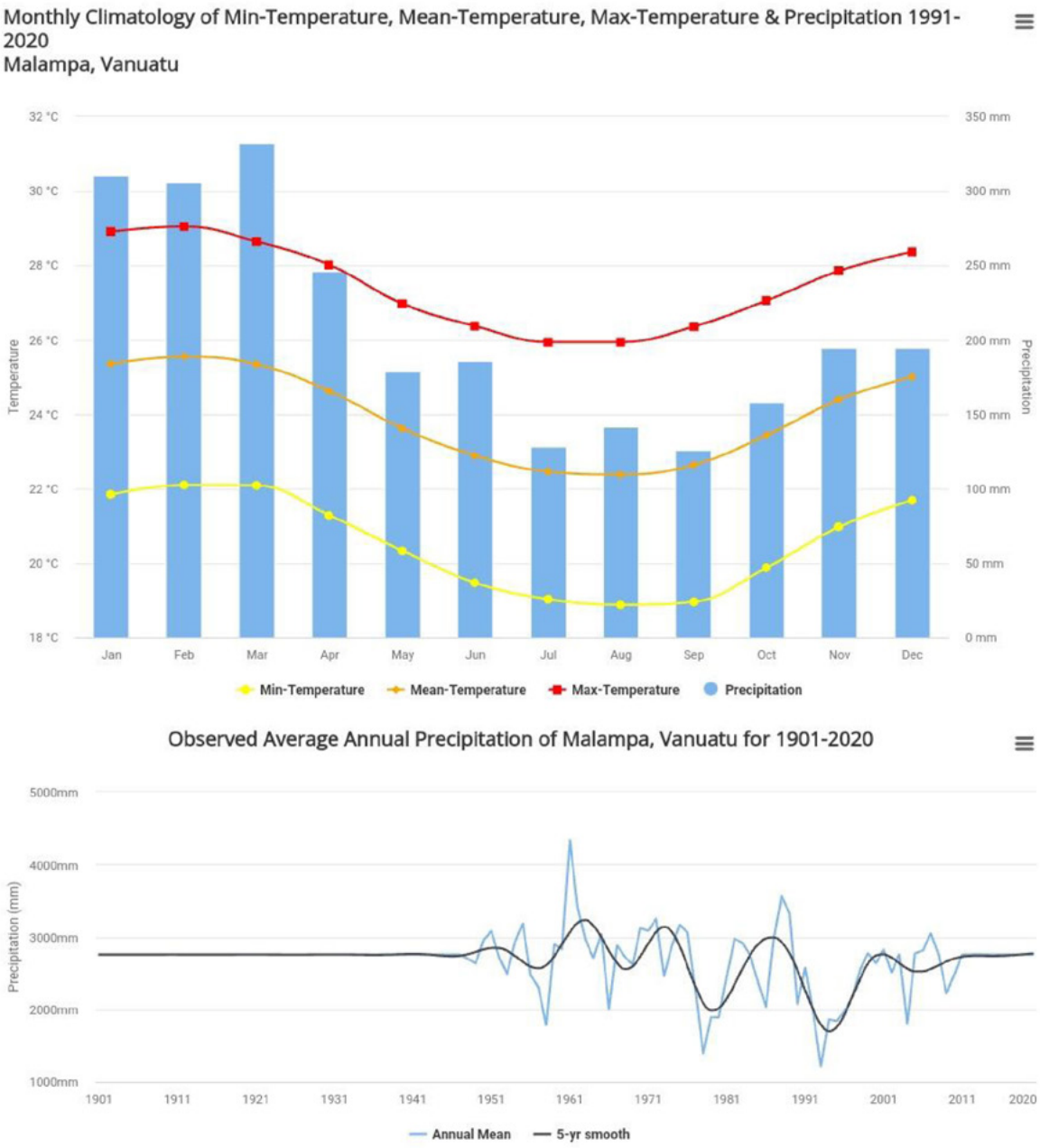


Figure 6. Observed average annual precipitation for Malampa Province 1901-2020

Olive Ridley totel. Foto hemi blong Panegyrics lo Granovetter – Flickr.com

4. Turtle management in Wiawi

4.1. Species present

Of the seven species of sea turtles present worldwide, five species are recorded in Vanuatu waters: loggerhead turtle *(Caretta caretta)*, green turtle *(Chelonia mydas)*, hawksbill turtle *(Eretmochelys imbricata)*, olive ridley *(Lepidochelys olivacea)*, and leatherback turtle *(Dermochelys coriacea)*. Only two species are recorded to nest in Wiawi beaches: hawksbill *(Eretmochelys imbricata)* whose global status is Critically Endangered and green *(Chelonia mydas)* whose global status is Endangered. Wiawi is also a foraging area for these two turtles and leatherbacks on the reef flat of Nesting site C (Figure 8).

4.2 Biology of turtles

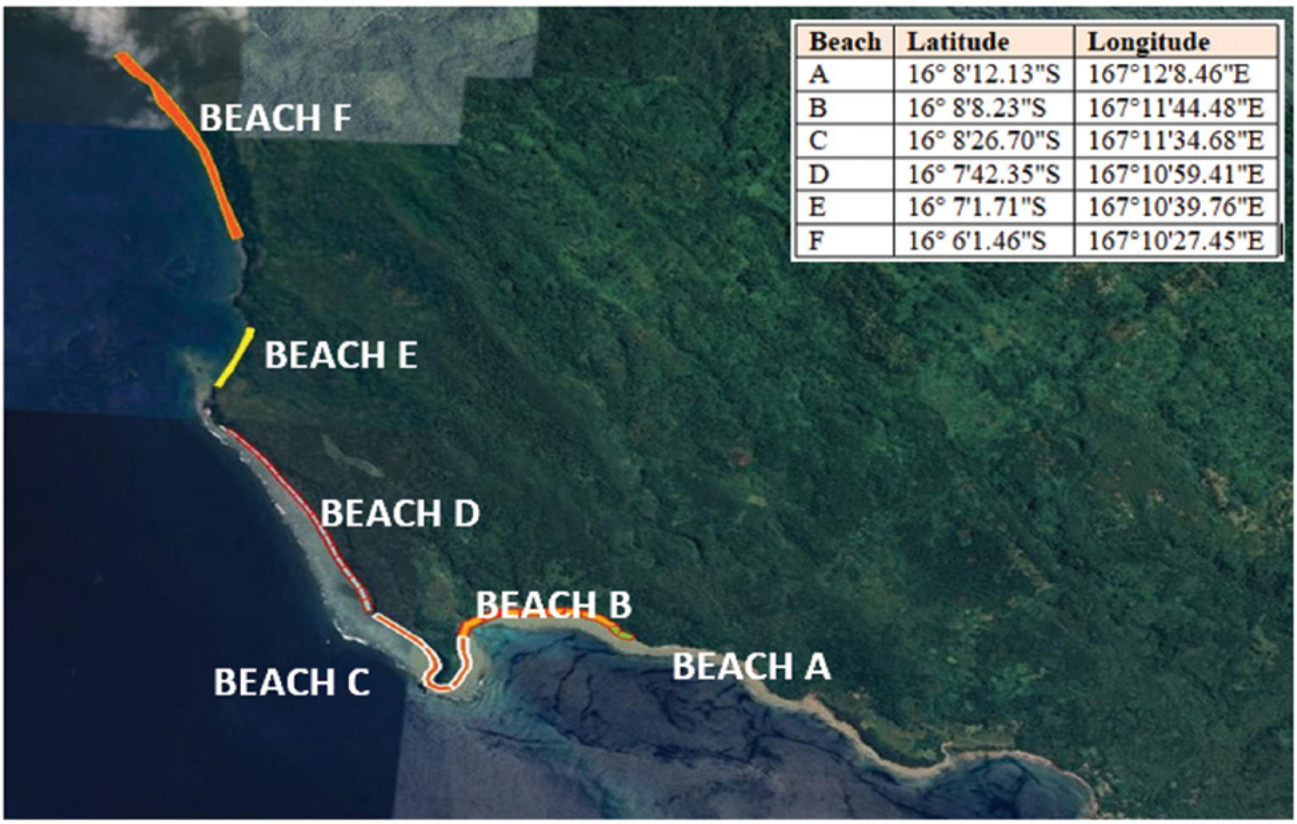
Sea turtles are long-lived, slow-growing species, characterised by a complex life cycle that utilises a wide range of habitats. Generally, sexual maturity is delayed in all species and varies between 20 to 50 years. Females lay about 50 to 130 eggs per nest dug in sandy beaches and can lay several nests per season. Hatchlings crawl out of their nest and enter the sea for the first time. From the many hatchlings that enter the sea, a lower proportion of the offspring survive the wild ocean to reach adulthood. They spend most of their life in the open ocean feeding on seagrass, invertebrates and jellyfish. They frequent the coastal areas for feeding and breeding when they become sexually mature. A female will always return to her beach of birth to nest. More information on the biology of sea turtles can be found in Hickey et al. 2023 [3]. Adult turtles are at high risk when nesting as the mother turtle dedicates its effort and energy to lay her eggs and will not be deterred by any disturbance (Figure 7).

Figure 7. Adult female turtle preparing her nest (a) and laying egg (b) on the beach at night

3 Hickey F., Aromalo D. and Straza T. 2023. A review of the management and conservation of sea turtles in Vanuatu. Apia, Samoa: Secretariat of the Pacific Regional Environment Programme, Apia, Samoa.

4.3 Nesting beaches at Wiawi

Sea turtles nest on beaches throughout the islands of Vanuatu but there are several beaches that are considered important nesting sites. These include Moso Island on Efate, Bamboo Bay and Wiawi on Malekula for hawksbill and green turtles, and Maranata beach on Ambrym and Votlo on Epi for leatherback turtles (Hickey et al. 2023) [4]. There are six beaches in Wiawi which are named as beaches A, B, C, D, E and F from the south and along the western coastline of Wiawi village. Beaches A, B and C are separated by imaginary lines and beaches C, D, E and F are separated by headlands up to the boundary with Wilak village. The headlands are inaccessible by walking, which presents challenges for monitors. Beaches A to E are of white calcareous sand while beach F is of black/grey sand from river runoff and is where leatherback turtles nest (Figure 8). The estimated position of the nesting sites is provided in Figure 8 and beach characteristics Figure 9.



Beach	Latitude	Longitude
A	16° 8'12.13"S	167°12'8.46"E
B	16° 8'8.23"S	167°11'44.48"E
C	16° 8'26.70"S	167°11'34.68"E
D	16° 7'42.35"S	167°10'59.41"E
E	16° 7'1.71"S	167°10'39.76"E
F	16° 6'1.46"S	167°10'27.45"E

Figure 8. Sea turtle nesting beaches at Wiawi Conservation Area

4 ibid.

Beaches A and B – white sandy beach

Beach C – rocky shore

Beach D – white sandy beach

Beaches E and F – black/grey sandy beach

Figure 9. Four characteristics of turtle nesting beaches in Wiawi

4.4 Turtle monitoring and inspection work

Turtle monitoring is a voluntary activity undertaken by the community with the support of WSB. Turtle monitoring activity is centred around the breeding season from July to April when adult turtles are nesting. Vanuatu turtle monitoring started in the 1990s following a regional campaign by the SPREP turtle programme to save declining turtle populations. In Wiawi, turtle monitoring work commenced in 2004 with the support of the WSB turtle programme. Chief Konel Nihapi was the first turtle champion of Wiawi after attending the WSB training (Figure 10). Later, a turtle monitoring committee was set up to involve the whole community but as a voluntary activity and, for the small community of Wiawi, committee members lost interest. Today, only Chief Konel and his two sons are actively conducting turtle monitoring activities in Wiawi and Charlson Nihapi has now taken over from his father as a turtle monitor.

Turtle monitoring activities are conducted annually when breeding turtles start to come ashore around August and September. Monitors visit all the nesting beaches during daytime and nighttime, check marked nests for damage and look for new nests and incoming females. After marking a successful nest, the track in the sand is removed so that it will be easy to identify a new breeder and the species. Nesting turtles are tagged and data recorded about the nests, including labelling the nest with the nesting date and estimated hatching date. Nest marking is done using wood and coconut fronds, with the date marked with a knife or a piece of coral. Monitors move by foot all the time and aim to visit nesting beaches twice every day during nesting season, which is an ongoing challenge. Beaches E and F are further north and only visited once during the daytime. The key activities of turtle monitoring during a breeding season are described in Table 2 (and Annex I for guidelines):

Figure 10. Chief Konel Nihapi, first Turtle monitoring Champion in Wiawi

Table 2. Monitoring activities carried out by turtle monitors

	Activity	Task Descriptions
1	Identify breeding beaches	Faenemaot olgeta ples long solwota we nes i stap long hem mo rekodem.
2	Marking of nests with date of entry and date of hatching (Figure 11c)	Each turtle nest is marked soon after the adult has covered its nest. A piece of coconut frond is written on with the arrival date of the breeder and expected date of hatching. The coconut frond is held with a stick stuck on the sand next to the nest.
3	Tagging of mother turtles and recording tag number	On arrival of the breeding female, the monitor will inspect the turtle for existing tags. If there is none, a new tag is prepared and the turtle tagged once the turtle had completed burying her eggs.
4	Daily inspection of nests until hatching	Turtle monitors of Wiawi conduct daytime and nighttime monitoring (using torches) for wild dog and domesticated dog damage of nests. It is hard work providing surveillance over the whole area on a daily and voluntary basis.
5	Night-time inspection of hatching	Inspection of hatchings is undertaken at night to ensure hatchlings return safely to sea.
6	Relocation of inundated nest (Figure 11a & 11b)	Where a nest is near high water mark, it is at risk of being inundated during storm surges. These nests are closely monitored and if in danger, the eggs are dug out, taken to a bamboo pen enclosure, and buried in a new hole. Disposition of the eggs leading to spoilage has been the main disadvantage of nest relocation.
7	Counting dead shells (Figure 11d)	Eggshells are normally dug out and counted to check on nest performance but this is not done for every nest.
8	Recording of tag numbers and turtle nests on TREDS logsheet and send to WSB	Data are recorded to paper logsheets and send to WSB after the nesting season or collected by the WSB Officer during his visit.
9	Equipment used by monitors	Equipment used by monitors includes torch, bucket, raincoat, spade, logsheet.

4.5 Relocation of damaged nests

Before every nesting season, a nesting pen is made or repaired ready for nest relocation. The nest pen is made of wooden posts and split bamboo fence attached with nails. When a nest is found to be in danger of being lost or damaged by inundation of flooding, the nest is dug up and eggs carefully removed and placed in a bucket with sand. The bucket is moved to the relocation pen and carefully placed in a newly dug nest. During relocation process, it is ensured that egg orientation is the same when they are being placed in a new nest. Moving eggs without proper handling training can lead to spoilage of eggs especially if not properly handled leading to varying results (Figure 11 and Annex II for best practice guidelines).

Egg relocation in a bucket

New nest preparation in a bamboo pen

Marking of nest

Counting of eggshells to record number of hatchlings.

Figure 11. Activities performed by turtle monitors during a breeding season

4.6 Turtle monitoring data management and reporting

Data recorded includes size (length) of turtle, sex, date of nesting, location of nest. This information is recorded in the TREDs database form and in an exercise book and passed on to WSB during the Turtle Monitors' Annual General Meeting or collected by WSB officer (Donald) during his annual visits to the site. The TREDs database is housed at the WSB office in Port Vila. Both VFD and DEPC have no access to TREDS database and have little knowledge of turtle monitoring data in Vanuatu so make no input to data quality and reporting to the community.

There are some issues with existing data in TREDS. According to the available TREDs data in Table 3 and Table 4, there were no green turtles nesting between 2008 and 2012, and in 2015 and in 2016 there was no hawksbill turtle nesting in Wiawi. However, according to community turtle monitors, the data recorded is questionable as hawksbill and green turtles have turned up every year to nest in Wiawi. In addition, two loggerhead turtles were tagged in Wiawi, but this information is not recorded in TREDS database. Turtle data held in the TREDS database for 2008–2019 showed 488 nesting hawksbill turtles and 214 nesting green turtles in Wiawi, which indicates hawksbills as the most important turtle nesting at Wiawi. Beaches D and E are the most important nesting beaches accounting for 85% of nesting overall and Beach D alone supported 41% of nesting turtles in this period.

Table 3. Green turtle nesting record for Wiawi (Source TREDs)

Year	Beach A	Beach B	Beach C	Beach D	Beach E	Beach F	Totol
	GT	GT	GT	GT	GT	GT	GT
2008							0
2009							0
2010							0
2011							0
2012							0
2013			2	1	6		9
2014	13	11	41	64	49	2	180
2015				2			2
2016				7	3		10
2017							0
2018			2	7	4		13
2019							0
Total	13	11	45	81	62	2	214

Table 4. Hawksbill turtle nesting record for Wiawi (Source TREDs)

Year	Beach A	Beach B	Beach C	Beach D	Beach E	Beach F	TOTOL
	HBT	HBT	HBT	HBT	HBT	HBT	HBT
2008				6	1		7
2009	4	2	3	9	13	1	32
2010	2	2	1	4	19	6	34
2011				2	1		3
2012					6		6
2013	1				5		6
2014	6	2	10	36	13		67
2015							0
2016							0
2017	4	2	7	43	13		69
2018	1		4	10	5		20
2019	36	9	42	118	76	7	244
Total	54	17	67	228	152	14	488

4.7 Tagging of adult turtle

Tagging all mother turtles encountered ashore to lay eggs is encouraged. Tagging involves placing a stainless steel metal tag on one of the front flippers. Tagging is performed after the egg laying has been completed and before the mother turtle returns to sea. Tag numbers are recorded. According to the monitors, all mother turtles encountered in Wiawi were tagged between 2008 and 2019, but this data is not clear in the TREDS data; the database records the total number adult turtles tagged in Vanuatu from 1991 to 2019 at 3,004 (Hickey et al. 2023) .

Tag recovery is very low with only three records for turtles tagged in Wiawi – one Wiawi tagged turtle was reported in Australia in 2008 and two tagged in 2008 returned to nest in Wiawi in 2009 (a green turtle and an olive ridley), although this information needs to be verified (Table 5). Further, another set of data held in the database showed total record of 37 nesting turtles in Wiawi from 1973 to 2015, which is inconsistent with nesting records in Table 6 and this indicates existing challenges in quality control issues of data being collected, which will be addressed by this management plan.

Table 5. Recovered turtles tagged in Wiawi. (Source TREDS)

Tag Number	Species	Sex	Tag Date	Recovered Date	Tag Location	Recovered Location	Activity when recovered
K34661	Green	Female	1992	17/12/2008	Australia	Wiawi	Nesting
R43154/ R43153	Green	Female	16/12/2008	05/02/2009	Wiawi	Wiawi	Nesting
R43164/ R43163	Olive Ridley	Female	08/12/2008	05/02/2009	Wiawi	Wiawi	Nesting

Table 6. Record of nesting turtles in Wiawi for the years 1973–2015 (Source TREDS)

Location	Island	Green	Hawksbill	Olive ridley	Loggerhead
Wiawi	Malekula	23	10	2	2

4.8 4.8 Electronic recording trial

Use of the SPREP managed Turtle Research and Monitoring Database System (TREDS) https://treds.sprep.org/help/ about application is recommended for use in the Wiawi Turtle management plan to upgrade turtle data recording. A step-by-step manual is available online on the database, and training and a login access can be provided upon request to SPREP (Figure 12). New users need to be set up with access and login. SPREP is also setting up *National Marine Turtle Monitoring Coordinators* (NMTMC) in each Pacific island country, who will assist with oversight of monitoring and data collection. Training is planned during 2024/25 for these NMTMC and for community monitors such as from Wiawi community and WSB turtle monitors.

Initial discussion with the Director of Fisheries is positive and one of the VFD data officers will need to be identified as the NMTMC and will be trained by SPREP. Community monitors can also be trained by SPREP.

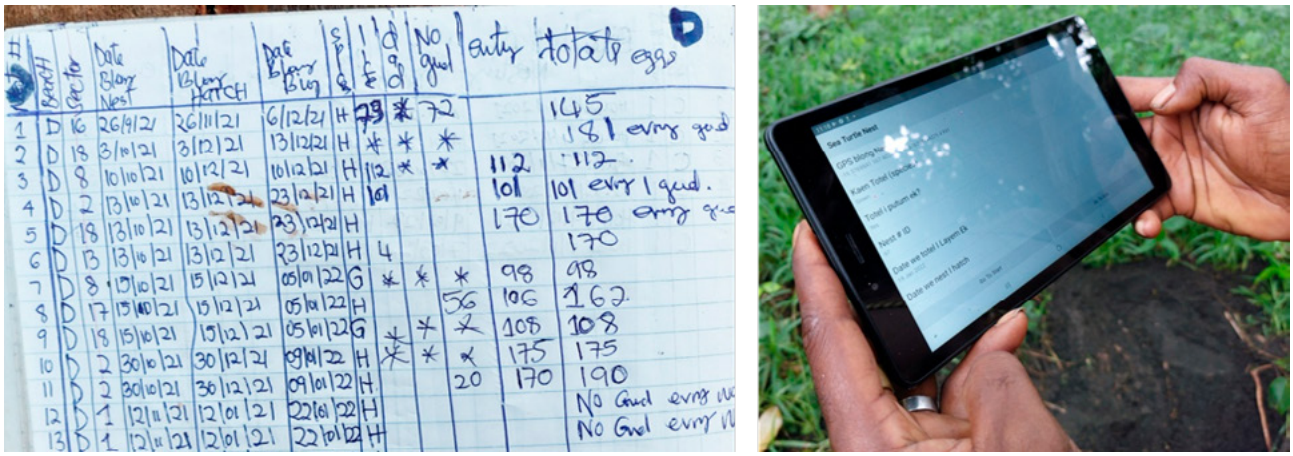


Figure 12. Upgrading to electronic data recording system

4.9 Enforcement of turtle management regulation

The Fisheries Regulation Order No. 28 of 2009 provides protection through a regulatory framework for sea turtle management, including regulating take of sea turtles for food and instituting a prohibition on the killing of the three main species of turtles (green, hawksbill and leatherback):

Fisheries Regulation Order No. 28 of 2009 (Cap 59) Marine Turtles

(1) A person must not:

(a) Take, kill, have in his or her possession, export, sell or purchase any or all of the following turtle of the species:

(i) Dermochelys coriacea, known as leatherback turtle, illustrated in Schedule 26;

(ii) Eretmochelys imbricata, known as the hawksbill turtle, illustrated in Schedule 26;

(iii) Chelonia mydas, known as the green turtle, illustrated in Schedule 26; or

(b) Take, have in his or her possession, sell, purchase or export any shell of the turtle species referred to in paragraph (a); or

(c) Interfere with or disturb in any way a turtle nest or any turtle that is in the process of preparing to nest or laying eggs; or

(f) Take, have in his or her possession, consume, export, sell or purchase any turtle egg; or

(g) Harm, capture, kill, consume, sell, purchase, export or destroy any turtle species (hatchlings, juveniles or adults) including by use of any weapon; or

(h) Have in his or her possession any marine turtles that is held in captivity in any way.

(2) Despite subclause (1), a person may apply in writing to the Director for an exemption from all or any of the provisions under subclause (1) for the purposes of carrying out customary practices, educational and/or research purposes.

This Regulation makes the killing of the three turtle species (green, hawksbill and leatherback) illegal, and prohibits use of any weapon, such as spear guns or gaff hooks to capture turtles. An exemption is given for traditional harvest, taking of turtles for educational and research purposes, and the killing of turtles is permissible within the law upon obtaining a valid permit. The challenge for Wiawi and in other communities in Vanuatu is the lack of enforcement of this regulation at the community level. VFD is addressing this by appointing Community Fisheries Authorized Officers to assist with enforcement in communities and this plan is recommending one such officer to be trained and appointed for Wiawi. Under the Environmental Protection and Conservation Act (CAP 283), Section 45(1)(f) allows the minister responsible to make regulations in relation to the control and taking of specified species and 2(b) provides for regulating the harvesting of natural resources.

Green Turtle Hatchling. Credit: tylerkaraszewski – Flickr

5. Challenges and threats for turtle management in Wiawi

Sea turtle nesting sites are under pressure globally from many threats including environmental changes caused by climate change. The greatest threat is from human activities on the coastal zone and direct human impacts from harvesting of adults and eggs and damage by domesticated animals. These impacts and challenges are discussed in greater detail in the *National Sea Turtle Management Review Report (Hickey et al. 2023).* The main threats for turtle nesting identified during the consultations with the community are provided with detailed descriptions in Table 7.

Table 7. Threats and challenges to turtles and monitoring work in Wiawi

	Issues, threats and challenges	Description
1	Geographical spread of the area and accessibility	Monitors are faced with the challenge of visiting all the nesting beaches once or twice a day during the day and at night by foot.
2	Lack of interest and motivation	Currently there are only two active turtle monitors in Wiawi. The monitoring committee set up in the past has been inactive because of lack of motivation by the committee. As a voluntary activity and for the small community of Wiawi it is difficult to keep up with an activity that generates no livelihood benefit to committee members.
3	Lack of awareness and education of other communities	Surrounding communities, especially in the north, lack awareness and education about turtle management and conservation. They are the ones involved in poaching of turtle eggs. The northern beaches are farther away and regular visits by foot is difficult. Awareness raising is encouraged to get surrounding communities to join the turtle monitoring network.
4	Remoteness and inadequate access to markets for livelihood needs	Livelihood needs are very important to any person in a community – having enough cash to meet basic needs is paramount when undertaking a conservation effort. Wiawi is blessed with valuable produce such as cocoa, copra, beef, kava, fish, timber and mats but access to the market is limited with no road and boat transport.
5	Health and sanitation lacking	Access to good clean water is key to improving health and well-being of the community members to stay healthy and undertake monitoring work. A new water system has been built but toilet facilities remain basic.
6	Predation of eggs by domestic animals	Most or all predation of eggs in Wiawi is from domestic dogs attracted by the smell of blood from freshly laid eggs and the odour from bad eggs during hatching. For instance, dogs have been found to follow the smell of eggs back to their original nest during egg relocating, leading to damage of other nests.
7	Predation of hatchlings on the beach at shoreline	Predation of hatchlings by seabirds, sharks, crabs and other marine predators when entering the sea for the first time.

8	Poaching of eggs by humans	Poaching by humans mainly from neighbouring villages to the north of Wiawi remains a concern because of lack of awareness, surveillance and enforcement of Fisheries regulation.
9	Killing of mother turtles	Killing of adult turtles and especially egg-laying mother turtles is rare nowadays but the ongoing lack of enforcement of existing laws, present remaining risks.
10	Loss of nest by inundation and flooding	Nesting habitat loss by sea level rise and erosion of nesting beach (manifested as wave overtopping), can lead to washing away of nests and induration of nesting eggs resulting in damage and spoilage of eggs.
11	Trampling of nest by domesticated animals	Cattle roam freely on nesting areas (Beach C and D) and have caused disturbance of the nest by trampling and to nesting female turtles during egg laying.
12	Temperature change of nesting beach from climate change	Alteration of nesting environment caused by temperature changes of the beach sand, inundation and/or flooding from heavy rainfall cause damage to viability of eggs and nests.
13	Deforestation of coastal vegetation	Coastal vegetation provides shade for nests and prevent excessive heat from the sun during daytime. Clearance and deforestation of coastal vegetation exposes nests to unnecessary heat and damaged of eggs.
14	Obstacle to movement on the beach	Stones, rocks and falling trees create obstacles to the movement of adult turtles and hatchlings on the beach. For instance, a female turtle was trapped by stones in 2022 and died due to exposure.
15	Lighting disturbances at night-time	Lighting causes disorientation of incoming breeders during nesting and disorientation of hatchlings (who will move towards the light instead of the sea).
16	Plastic waste pollution	Plastics and solid waste and other marine pollution and debris can trap hatchling turtles on the journey to open oceans, cause entanglement and be ingested by turtles foraging for food.
17	Lack of enforcement of fisheries laws in the community	Enforcement of existing regulations on turtles is lacking in the community and is a challenge for the community, as they have no power to carry out this role. There is a need to set up a Community Fisheries Authorized Officer for Wiawi.
18	Chiefly authority issues between the two chiefs affecting monitoring work	Ongoing issues between the two Chiefs (Timothy and Konel) has led to an inactive turtle monitoring committee. This is also affecting the ongoing monitoring work and needs to be addressed for the turtle monitoring committee to be effective.
19	Lack of monitoring committee	Monitoring work is now done only by Chief Konel and his son. They face ongoing challenges and lack of motivation by the young people and women in Wiawi.

Figure 13. Damages to nest and hatchlings in the Wiawi area from dogs, cows and predators such as crabs

6. Gender and social inclusion in turtle management and conservation

Turtle monitoring in Wiawi is considered a male dominated activity and the participation of women and girls is limited. During consultation, women expressed their desire to be involved in monitoring activities. The Wiawi Community Turtle Management Plan recognises the women's contribution to the management of turtles in Wiawi and coastal fisheries in general and promotes more inclusive fisheries management and livelihoods. The measures and experiences used in designing this plan are based on the many years of community monitoring and protection of breeding turtles and nests since the 1990s. All forms of social exclusions and marginalisation are addressed in this plan to ensure the economic and environment benefit derived from this plan is shared equally amongst the community, including women and girls and those with a disability. Collaboration and involvement of women and girls will be encouraged to achieving equitable distribution of benefits from this management plan. The community of Wiawi and the Chiefs agree to work together to revive the turtle Monitoring Committee and have women representatives in the committee to enable a joint effort by all community members to protect our sea turtles.

Green turtle swimming in the sea. Credit: Kris-Mikael Krister – Flickr

7. Wiawi turtle management action and implementation

This section is the most important section providing key management actions and implementation responsibility to meet the major objectives of this plan. The 19 issues, challenges and threats identified in Table 7 are addressed in seven action activities shown in separate tables (Table 8 to Table 14). Implementation time frames are not identified because this is a community plan where budget allocation is not available. Implementation of actions is dependent on the support of projects through respective Government departments and partners, so the timeframe column is left blank to be filled when the activity implementation targets are achieved. The seven action tables are:

- Table 8 – Turtle nest monitoring
- Table 9 – Turtle nest relocation
- Table 10 – Nest and hatchling predator control
- Table 11 – Turtle data management and reporting
- Table 12 – Community network engagement
- Table 13 – Sustainable financing
- Table 14 – Program Governance

Table 8. Turtle nest monitoring action and implementation

	Issues, threats and challenges	Action to address the issue	Materials and equipment Needed	Responsibility	Date achieved
1	Beach sector locations are not clear.	GPS map all beaches and zones. Put small signboards at the beginning and end of each beach zone/sector for example "B3" to enable monitors to accurately identify a beach sector.	GPS enabled tablet, signage, camera, small signboards (marine plywood or plastic, nails and screws, black and white paint)	Local Monitors, Projects	
2	Inconsistent monitoring protocol adopted by monitors.	Follow Nest Monitoring Guideline for Wiawi – Annex I. Produce a short educational film about turtle nest monitoring technique to educate monitors.//Provide ongoing training on best practices in nest monitoring.//Use SPREP monitoring guideline for communities.	Stationery, posters, videos and printouts	WSB, VFD, DEPC	
3	Lack of proper monitoring tools and materials to undertake monitoring.	Purchase basic tools and materials for nest monitoring activities including raincoat, reflective vests, tags, tag applicators, field notebooks, master record books.	GPS, tape measures, headlight torch, spotlight torch, waterproof pouches.	Projects, WSB	
4	Monitors spend late nights and early mornings patrolling beaches and have no shelter.	Construct a Turtle Watch House/ Centre with satellite internet connectivity, solar power and accommodation supplies and materials for monitors during extended patrols, visiting researchers and eco visitors.	House construction materials, solar system, 3link satellite internet, beds, mattresses, mosquito net, toilet, kitchen tools etc.	Fisheries Dept., Community turtle monitors	
5	Nest marking is inadequate – bamboo nest markers often lost or damaged.	Improve nest marking, ensuring all nests are marked with bamboo or more permanent materials that are reusable.	Nest markers (bamboo or sign plastic)	Projects Community	
6	Damage to nests and eggs on remote beaches by humans and dogs and no surveillance.	Awareness raising, regular visits using a boat and binoculars, Fisheries Authorized Officers to be trained to improve surveillance and enforcement.	Cameras, binoculars, boat	Projects, DEPC	

	Issues, threats and challenges	Action to address the issue	Materials and equipment Needed	Responsibility	Date achieved
7	Nests in hot exposed locations, may be unsuccessful.	Install nest temperature loggers on every nesting beach to better understand sex ratio outcomes of hatchlings. Logger to record hourly temperature, with data downloads every 3 months, and battery changes every year.	30 x nest temperature loggers (Tiny Tag Plus 2 brand), AA batteries.	Projects, VFD	
8	Waves wash out many nests during storms.	Relocation of affected nest following best practice guidelines. Training of monitors on handling of eggs.	Yusum ol lokol o moden materiel blong pulum fanis raon long eria	Komiuniti mo WSB	
9	Fence the area using fencing material of local or modern materials.	Community and WSB	N/A	Komiuniti ol monita, WSB	
10	Rocks and stones impede the laying of eggs and successful crawls of hatchlings.	Relocation of affected nest following guidelines in Annex II. Training of monitors on handling of eggs, clearing of the main beaches.	N/A	Community monitors, WSB	
11	Not enough monitors to patrol all beaches.	Formally employ 2 existing monitors from September to February and 1 monitor in June, July, August, March and April.	N/A	Projects, VFD or DEPC, WSB	
12	Some beaches are too far to access on foot, and during high tides (E, F).	Use turtle monitoring house. Use a boat to access far location.	Boat hire and fuel	Community and projects	
	Tagging of turtles with satellite tags.	Tag turtles with satellite tags to better understand where Wiawi turtles travel, feed and breed.	Satellite Tags and associated equipment	Projects, SPREP, WSB, Fisheries Dept.	

Table 9. Turtle nest relocation action and implementation

	Issues, threats and challenges	Action to address the issue	Materials and equipment Needed	Responsibility	Date achieved
1	Some nests are exposed to wave overtopping.	Fence the area using fencing material of local or modern materials. Relocate only turtle nests that are endangered by rising sea levels and wave overtopping, especially nests on Beach C near rocky areas and cattle. Training of monitors on handling of eggs.	Bamboo, wooden post, shovels, plastic buckets, spade	Community	
2	During storms, waves wash out many nests.	Relocation of affected nest following guidelines in Annex II. Training of monitors on handling of eggs.	Fence the area using fencing material of local or modern materials, shovels and plastic buckets	Community and WSB	
3	Rocks and stones impede the laying of eggs and successful crawls of hatchlings.	Relocation of affected nest following guidelines in Annex II. Training of monitors on handling of eggs.	Fence the area using fencing material of local or modern materials, shovels and plastic buckets		
4	Cattle trampling on nests cause damage to the nest.	Fence off the beaches from Cattle Plantations along beaches B and C to prevent cattle walking on nesting beaches.	Cattle fencing (1 km) including barbed wire, staples and chainsaw for cutting posts	Community Projects	
5	Not enough awareness and training on nest relocation.	Produce a short educational film about nest relocation.	Filming, editor; scientific advice on relocation	Projects, VFD, SPREP	
6	Monitors do not have proper tools and materials.	Purchase basic materials for nest relocation activities.	Shovels, buckets, nest ID board	Projects, WSB	
7	Monitors do not have the skills and know-how to handle eggs during nest relocation.	Train turtle monitors on best practices in nest relocation, either in person or via a relocation training video that can be used to induct monitors.	Trainer and training materials	Projects, WSB, VFD	
8	Existing turtle nest relocation pen is old and needs repair or building of a new one in a new location.	Improve and renovate current beach hatchery pen with more durable material such as plastic fencing. Build a turtle nest relocation area near the turtle house to house nests endangered by wave wash-overs.	Plastic mesh, poly-coated or galvanised steel fencing 150 m length, at least 1.8 m high, with mesh sizes 20 cm – 30 cm wide, fencing staples, hinges and timber for posts and entry door	Community and Projects	

Table 10. Nest and hatchling predator control action and implementation

	Issues, threats and challenges	Action to address the issue	Materials and equipment needed	Responsibility	Date achieved
1	Damage of eggs by animals, especially dogs.	Construct and deploy nest protective cages (180 total) for each zone on beaches D and E (6 per zone x 30 zones) to cover nest.	180x lightweight metal alloy cages, 1.5 m x 15 m	Projects, Community	
2	Poaching of eggs by people.	Ongoing legal awareness briefings with surrounding communities on turtle regulations.	Turtle regulation posters, videos and printouts	Police, VFD, DEPC, Area Council, WSB	
3	High mortality of hatchlings from predators near the shoreline.	Collect hatchling turtles once they reach water line and move them to deeper waters to avoid high-risk area. Alternatively, swim with the hatchling turtles as they cross the reef.	Boat hire and snorkelling gear	Local Monitors	
4	Lack of signage to inform public of the turtle nesting areas.	Install signs at regular intervals (200 m) along all beaches reminding locals of turtle regulation on taking of eggs and associated fines.	Pre-printed notice signs (marine ply or plastic, approximately A4 paper size, portrait orientation), nails/bolts, timber/metal stands	Projects, Community, VFD, WSB	
5	No enforcement of turtle management regulation in the community.	VFD to appoint Fisheries Authorized Officer for Wiawi community to enforce compliance of the regulations and report incidences.	NA	VFD, Police	
6	Improve church involvement in turtles and marine conservation.	SDA Church rule about not eating turtle eggs or meat is a positive practice that should be maintained. Church Leaders to hold at least one meeting per year or as part of their service to hold prayer session on conservation and management of wildlife of Wiawi.	NA	Chief and Church Leaders of Wiawi	
7	Too many domestic dogs in village causing damage to turtle nests and hatchlings.	Limit the number of dogs each household can have.		Community	

Table 11. Turtle data management and reporting action and implementation

	Issues, threats and challenges	Action to address the issue	Materials and equipment needed	Responsibility	Date achieved
1	Paper records are prone to damage and loss during transport to Port Vila.	Move to electronic data recording by developing a front end for the TREDS database for community recording of turtle data. Keep additional diary for daily record of activities.	Diary and Tablets	Projects, SPREP	
2	VFD do not have access to turtle monitoring data and cannot assist to improve data management.	VFD to be the main focal agency of SPREP on turtle data management, quality control and reporting.	Computer system	VFD, DEPC, SPREP	
3	Turtle data quality issues in SPREP database because there is no quality control on data being collected.	Set up National Focal Agency for turtle data management to assist quality of data from community monitors.	NA	VFD, DEPC and SPREP	
4	Late submission of data after each season.	Move to electronic data recording application to improve transmission and access.	NA	VFD, DEPC and SPREP	
5	Lack of data management skills for VFD and community monitors.	Training for monitors and focal agency on correct data recording and use of electronic data recording tools.	Stationery and printouts, Tablet	SPREP, Projects, VFD, WSB	
6	No data analysis.	Set up TREDS database at VFD and undertake training on analysis and reporting of data to communities and governments.	N/A	SPREP, VFD, WSB	

Table 12. Community and network engagement action and implementation

	Issues, threats and challenges	Action to address the issue	Materials and equipment needed	Responsibility	Date achieved
1	Multiple projects and partners working in Wiawi and it gets confusing about who is doing what.	Hold at least two community update meetings per year to provide updates on turtle nesting/tagged/hatched as well as other topics like waste management, conservation, natural resource use, etc., including with special and tailored training for women only.	Projector, generator, screen, laptop, software, posters, printouts, videos.	DEPC, VFD, WSB, SPREP	
2	No regular feedback to the community on data collected.	Upgrade to electronic recording, VFD to access TREDs database, training on coordination, management and reporting back to community annually.	Travel costs, tablets, laptop, internet/ phone credits	SPREP, WSB, VFD	
3	Lack of exposure of monitors.	Participate in annual meetings of WSB Vanua Tai Resource Monitors, as well as other meetings, trainings and events relevant to sea turtles and environmental management hosted by Government or other partners.	Travel costs	WSB, Projects, VFD, DEPC	
4	No mechanism for monitors from nearby villages to engage with each other.	Participate in, and regularly host meetings, training activities and events of the NW/SW Malekula Network, the Malekula Protektem Risos Coalition and other local networks.	Travel costs	Area Council Malekula Protektem Risos Coalition NGOs	
5	Not enough outreach about turtle conservation in Wiawi.	Have an exchange programme with monitors from Bamboo Bay.	Travel costs	Wiawi and Bamboo Bay monitors	

	Issues, threats and challenges	Action to address the issue	Materials and equipment needed	Responsibility	Date achieved
6	Lack of participation by youths and women in monitoring activities.	Engage youth and women in field visits and exchange programmes to other turtle monitors and conservation sites, and host champions from other islands to come to Wiawi.	Travel costs	All communities and islands	
		Make sure that there are women monitors because women are not often included in marine and turtle decision-making, and women play a role in training children to respect the environment.	NA	Chiefs and village authorities	
		Develop a Young Turtle Monitors programme to train and engage with young men and women to undertake conservation work, and hold events on special days like Children's Day.	NA	VFD, DEPC, WSB	

Table 13. Sustainable financing and livelihood development action and implementation

	Issues, threats and challenges	Action to address the issue	Materials and equipment needed	Responsibility	Date achieved
1	No income generation from turtle monitoring work.	Develop a Wiawi nature tour for tourists including forest tour, bird watching, turtle nesting watch and snorkelling.	None	MALFFB, MALAMPA Province, Vanuatu Skills Partnership, Area Council	
2	Limited market access for traditional cash crops – cocoa, copra, kava, fish, beef and mats and paper.	Complete development of road to Wiawi and obtain a boat to provide sea transport service to the community as the second option to take more produce to the market including cocoa, copra, pepper, beef, roots crops, fish, timber and mats and virgin oil.	None	PWD, MALAMPA province, NW Area Council, Agriculture Dept, Livestock Dept	
3	Lack of tourism activities despite good natural attractions.	Work with Tourism Department to prioritise cruise tourism and identify location of moorings for yachting and registration. Develop fee rate for research activities in Wiawi by students and researchers for turtles, marine and terrestrial resources.	None		
4	Lack of accommodation to house visitors and tourists.	Develop guesthouse such as the turtle monitoring centre house and set up a committee to manage it and come up with room rental charges.	None	Community, VFD, DEPC	
5	Lack of publicity of conservation area.	Set up a Facebook page (Wiawi Tabu) and post regularly.// Set up an email account. (WiawiConservation@gmail.com)//Set up a basic project website.//Write donor project applications for critical items like monitor stipends, a boat to access remote beaches.	Computer and internet//Laptop, expert support	Projects, VFD, WSB, DEPC, SPREP. Area Council	

Table 14. Programme governance action and implementation

	Issues, threats and challenges	Action to address the issue	Materials and equipment needed	Responsibility	Date achieved
1	Leadership issue between the two chiefs is affecting development committee work.	Chief Timothy and Chief Konel to resolve their leadership issues so that family members of Chief Timothy can participate effectively in the turtle monitoring committee.	None	Chief Timothy and Chief Konel	
2	Inactive turtle monitoring committee	Resurrect turtle monitoring committee and use this same committee for other activities such as water, tourism etc, address livelihood incentives.	Mobile phone, stationery	Chiefs and people of Wiawi	
3	Miscommunication and confusion between the Chiefs and Monitors.	Resurrect turtle monitoring committee. Improve communication between committee and the Chiefs.	Laptop, mobile phone, stationery	Wiawi chiefs, Vanuatu Climate Action Network, WSB, Cultural Centre	
4	Multiple departments and overlapping projects.	Run ongoing good governance and project management training with Wiawi leaders, e.g. bookkeeping, meeting facilitation, report writing, project proposal writing, monitoring and evaluation, etc.	Training Materials	Oxfam, Vanuatu Climate Action Network, WSB, Area Council	
5	Capacity to manage projects is limited.	Request a volunteer to support programme operations, including environmental work, sustainable finance and programme sustainability.	Volunteer accommodation	JICA, Volunteer Service Overseas, Australian Volunteers, Peace Corps	
6	Governance capacity is limited	Regularly write donor project applications for critical items like monitor stipends, a boat to access remote beaches, animal cameras, community development programmes, etc.	NA	Wiawi Community Leaders and experts.	

Green turtle swimming in the sea. Credit: Freepik

1. Guidelines

Specific Guidelines are developed to provide a step by step guide for local monitors to use when undertaking specific activities that require extra care and these activities include.

(a) Tagging of nesting turtles and recording – Turtle tagging and proper recording – (Annex I)

(b) Relocation of nest and eggs that are at risk of being damaged by inundation to a safer location (Annex II)

Pat I.
Tagging of nesting turtles and data recording guidelines

Step 1. Beach monitors should always carry the following equipment:

- Backpack for holding tools
- Tag Applicator: simple pliers with working surfaces moulded to fit the tag, and with levers requiring less hand pressure for application.
- Turtle Tags: metal alloy tags bearing a unique serial number and the host institution's name/address.
- Head torch – to allow for hands-free measurements
- Spotlight torch – only for use to light the area after laying has begun
- Flexible tape measure – waterproof and ideally 3 metres long
- Tablet or Phone – for photos, GPS marking, data entry and communications.
- Waterproof pouch for phone/tablet
- VHF/UHF Radio – for two way communications among beach monitors
- Raincoat
- Reflective vest for visibility
- Binoculars to check for nesting turtles down the beach on moonlit nights

Turtle monitoring tools and equipment

Step 2. Trained monitors

Beach monitors must be fully trained, as nesting is a particularly vulnerable time, and any disturbance during their crawl up the beach and during nest digging can cause a female to abandon a nesting attempt. A SEA TURTLE SHOULD NEVER BE FLIPPED OVER UNLESS UNDER STRICT SUPERVISION OF A TRAINED SEA TURTLE MONITOR.

The following should be kept to a minimum during patrols:

- noise of any kind: loud talking/laughing or music;
- lights: do not build fires or use strong spotlight torches; and
- physical disturbance to turtles: turtles should never be touched, lifted, moved, blocked, corralled or otherwise physically disturbed.

Note: Once turtles begin to lay their eggs, they are fully committed and will generally complete the nest even in the face of mild disturbances required for nest monitoring (measurements/tagging etc.).

Step 3. Save long taem we mama totel i kam sho blong nes

- Turtles in reef areas tend to begin their crawl with an incoming tide. For deeper sea areas, turtles can lay at any time. Obtain a tide chart and plan the monitoring to begin around 2 hours before the highest tide.
- Turtles in Bamboo Bay almost always lay eggs at night, and so patrols typically start at dusk.

Step 4. Watch for tracks

As you patrol the beach you will come across nesting turtle tracks:

- Hawksbill turtles have asymmetrical tracks, with the right flipper, then left flipper indenting the sand as the turtle moves forward.
- Green sea turtles have fully symmetrical tracks, as both flippers pull the turtle forward simultaneously.
- Leatherback turtles also have symmetrical tracks.

Trak blong Grin totel

Trak blong Hoksbil totel

Marine Turtle Track Identification Key

Track Features

Early morning monitoring is best as tracks will deteriorate over time. The clarity of tracks can be affected by flipper damage, terrain, sand moisture, tides, wind and weather.

The key track identification features are:

- Stroke Style
- Track Width
- Hind Flipper Marks
- Front Flipper Marks
- Plastron Drag
- Tail Drag

Track Direction

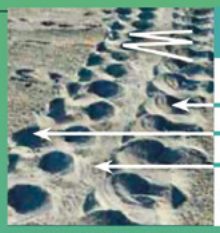
Clues to determine track direction:

- Turtles push sand backwards, the higher sand mound is at the back.
- If track overlaps, the top track is the returning track.
- Sand is always thrown back over the emerging track when digging.

Measuring Width

Measure from outer edge of track. This may be the front or rear flipper, depending on species.

Alternating Stroke
Flipper marks alternate



Loggerhead

Track Width: Less than 1 metre

- Hind Flipper
- Front Flipper
- Plastron Drag
- ✕ Tail Drag: Not present

Hawksbill

Track Width: Approx. 70–80 cm

- Hind Flipper
- Front Flipper
- Plastron Drag
- Tail Drag

Olive Ridley

Track Width: Approx. 70–80 cm

- Hind Flipper
- Front Flipper
- Plastron Drag
- Tail Drag

Breast Stroke
Flipper marks side by side

Green

Track Width: Approx. 94–144 cm

- Hind Flipper
- Front Flipper
- Plastron Drag
- Tail Drag

Flatback

Track Width: Approx. 90–100 cm

- Hind Flipper
- Front Flipper
- Plastron Drag
- Tail Drag

Leatherback

Track Width: Greater than 2 metres

- Hind Flipper
- Front Flipper
- ✕ Plastron Drag: Not Visible
- Tail Drag

Step 5. Finding the female

1. If you see only one set of tracks moving toward the littoral vegetation, do not use torchlights to find her, as she may still be preparing her nest and if disturbed, may abandon the attempt.
2. Listen for sounds of sand being flung, suggesting nest digging is underway.
3. Walk or crawl slowly towards the sounds of digging, or follow the tracks.
4. It is not uncommon for a female to move around considerably on the upper beach looking for an appropriate nest site, free from vegetation, roots, debris or stones.
5. It is not uncommon for a female to commence digging a nest, find it unsuitable and move to another spot several metres away.
6. Wait for the female to commence laying before shining any lights or undertaking any measurements! Do not shine lights in the turtle's eyes, even while nesting. Red lights, if available, are best.

Female digging nest

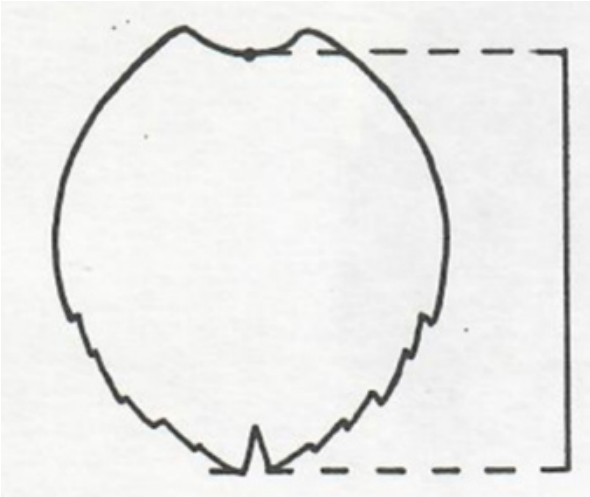
Egg laying process

Step 6. The following basic information should be collected for each nesting female:

- Date of laying
- Beach and zone/sector
  - Letter/Number Code
  - GPS point
- Species of turtle
  - Hawksbills lay smaller (4 cm) and more numerous eggs (up to 250), average 170). Tracks are asymmetrical.
  - Greens lay larger eggs (5 cm), though less numerous (up to 200). Tracks are symmetrical.
  - Leatherbacks lay very large eggs, (6 cm–6.5 cm), but typically lay less than 120. Tracks are symmetrical.
- Saes blong totel
  - 'Standard Carapace Length' (SCL) – longfala blong sel long baksaed, makem long wan tepmesa we yu save benem folem medel blong baksaed, statem long en blong sel long fored kasem en blong sel biaen olsem long pikja
  - Carapace Width – bigwan blong sel, makem long wan tepmesa i go kros long medel blong baksaed long ples we sel blong hem i bigwan, statem long en blong sel long lefsaed kasem en blong sel long raetsaed
- Size of turtle
  - Standard Carapace Length (SCL) – curved measurement with flexible tape from precentral scut at carapace midline to posterior margin of postcentral.
  - Carapace Width: curved measurement with flexible tape of the distance across the widest part of the shell perpendicular to the longitudinal access.
- Any existing tag information
- New tag information

Tag numbers (see below).

- Environmental factors
  - Time of laying
  - Tide level
  - Star/Moon conditions
  - Temperature
  - Beach vegetation around nest



Turtle length (size) measuring method

Length measure along the back

Step 7. Tagging

- After egg laying has been fully completed, and the female has started to cover the nest, tagging can commence.
- It is best to tag the turtle while it is still burying the nest. Once it starts to walk back to the sea it is very difficult to contain and tag the turtle.
- Clean the tags with an antiseptic solution (alcohol, betadine or other antibacterial cream.
- Wipe the flipper location with an antiseptic solution, both upper and lower location.
- The tagger should ensure s/he has clean hands.
- Tag the turtle on both the right and left flipper.
- The tag should be placed along the trailing edge of the fore flipper, proximal to, between or through the large scales edging the centre part of the flipper.
- The sharp point of the tag should be placed on the top of the flipper and perforate and bend at the bottom.

  The tag should be applied quickly with a firm and resolute squeeze of the applicator.

  Note that the turtle will react strongly when tagged, so care should be taken to avoid injury to both the turtle and the tagger.

Tagged turtle on the back flipper

Stainless steel tag with unique number

Step 8. Post laying

Once measurements have been made and tags applied, the female should be left alone as soon as possible to finish covering her eggs and make her way back to the sea. Avoid all physical, light and noise disturbances.

Step 9. Nest markings

Comprehensive record keeping should be made of each nest.

Recording should be done as soon as possible after laying (e.g. within 24 hours).

Locate the exact location of the nest, taking note that the hole is usually found on the seaward side of the cavity.

Place a marker (usually a stick or pole) in the beach near (but not on) the nest hole.

Write on a board or piece of bamboo the following basic information:

- Nest ID (Beach/Zone)
- Date of laying
- Turtle species
- Expected Hatch Date
- Dig date

Preparation of bamboo for nest tagging

Writing of date on bamboo tag.

Turtle nest marking

Hawksbill turtle swimming in the sea. Credit: denAsuncioner – Flickr

Pat 2.
Turtle nest relocation guideline

Relocation of turtle nests is not best practice and should only be done when necessary to protect the nest from a real threat. It is best to leave the nest where the mother turtle placed it. Before moving any nest, monitors must carefully consider the following points:

Step 1. Assess if there is a need to move the nest

Is the nest safe or not? Use these three questions:

- Has the mother turtle laid this nest within the last 4 hours?
- Is the nest in a place where seawater might wash it away or inundate it?
- Is there construction work or other disturbance happening nearby that could damage the nest?
- Is the nest located on a road or a place where people or animals regularly pass?

If any of these risks exist and the nest is less than 4 hours old, relocation may be necessary. If not, leave the nest in place.

Step 2. Identify a suitable new nest site

Find a safe place to move the nest to. The new site should be similar to where a mother turtle would normally choose — under a tree or in shade, not too far from the sea. If moving the nest into a protected enclosure (like a fenced area), it must be shaded and similar to a natural nest site.

Step 3. Equipment needed for relocation

Plastic bucket, shovel or stick, hand power (digging should be done by hand as much as possible)

Step 4. Timing of relocation

Relocation should only be done after sunset or in darkness. This is because the mother turtle lays eggs in the dark, and moving the eggs within 4 hours of laying reduces the risk of harming them. Do not wait more than 4 hours after laying to relocate.

Step 5. Who should relocate the nest

Only trained turtle monitors should perform nest relocations.

Step 6. Excavating the nest

The mother turtle often places eggs on the seaward side of the nest cavity. Digging must be done by hand by trained monitors.

Identifying damaged nest or nest at risk for relocation

Step 7. Carefully remove eggs, place in a bucket, and count

Place some sand from the original nest site at the bottom of the container to prevent eggs from moving during transport. Take great care to avoid breaking any eggs. If any egg breaks, remove it and its contents to avoid contaminating the others.

Mark the top of each egg with a marker pen if possible, to help keep track of egg orientation. Usually, the top of the egg is clean white, while the sides and underside are dirty from sand.

Measure the depth of the original nest to replicate it later. All eggs must remain in the same position as laid, with the marked top side always facing up.

Removal of eggs from damaged or inundated nest and careful placement of nest in a bucket

Step 8. Move the eggs to the new nest site

Carry the bucket carefully to the new nest site or enclosure.

Walk slowly and avoid shaking or rotating the eggs. If relocating during the day, prevent sunlight from shining directly on the eggs. Cover the bucket to protect from rain if necessary.

Step 9. Dig the new nest and place the eggs inside

Dig a new hole as deep and shaped as close as possible to the original nest. Use hands or a small stick for digging. Try to make the size and shape of the new hole as similar to the original nest as possible. It is good practice to dig the new nest near the old one, but higher up the beach – this will make it faster and easier to move the eggs.

Step 10. Place the eggs inside the new nest

Place each egg individually into the new nest, maintaining original orientation. Eggs from the bottom of the original nest should be placed at the bottom of the new nest, and those from the top at the top.

Do not add sand between the eggs. Any small amount of sand already on the eggs is enough.

Once all eggs are placed, bury the nest and compact the sand gently but firmly around the top, replicating the compactness of the original nest. Add a small mound of sand on top to make the nest look like a natural one. Green turtle nests should have 50 cm of sand above, and Hawksbill nests 30–35 cm minimum. Adding a little extra sand is always good.

If more than 4 hours (or even several days) have passed but the nest is at risk of being washed away, carefully excavate and relocate using the same careful method, but be extremely cautious as eggs will be more fragile after this time.

Digging of new nest and relocating eggs to the new nest making sure of minimal disturbance of egg orientation.

Step 11. Mark the relocated nest

Once relocation is complete, record the following details on a marker (stick/bamboo):

- Species of turtle
- GPS location of the original nest
- Area where the new nest is located (Beach/Zone)
- Date the mother turtle laid the eggs
- Number of eggs
- Expected hatch date (~60 days after laying)
- Dig date: hatch date plus 10 days (for survival monitoring)

Marking of relocated nest

Step 12. Release hatchlings when they emerge

Eggs will hatch naturally, either in the daytime or night. Monitors can help carefully remove hatchlings from the nest and place them on the beach to make their way to the sea. Stay with the hatchlings to ensure they safely pass through the reef and into deep water, protecting them from predators like birds, fish, and sharks.

Do not release hatchlings during daylight to avoid predation.

Step 13. Excavation and record keeping after hatching

The monitor who relocated the nest should be present at the excavation after hatching to record results: Count the number of hatchlings that successfully escaped (SE). Count the number of dead hatchlings in the nest (DN). Count the number of unhatched eggs (UH). Calculate survival rate: SE / (DN + UH).

Digging of nest after hatching to estimate hatching rate

WIAWI
NAGHA PINEIA
KASTOM KONSEVESEN PROGRAM - MALEKULA

BEACH F

BEACH E
Zones 1 - 2

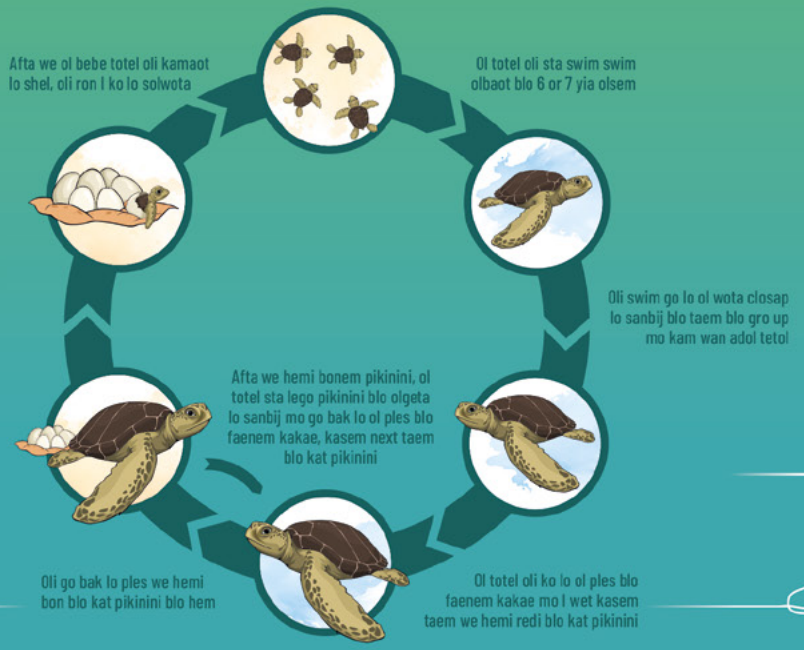
BEACH D
Zones 1 - 18

BEACH C
Zones 1 - 3

BEACH B
Zones 1 - 7

BEACH A
Zones 1 - 2

HEMI TABU BLONG KILIM O KAKAE EK MO MIT BLONG TOTEL



Rispektem lo blong Jif!

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