# Environmental Education

# for

# Sustainability

# Guidelines

**Department of Education**
**with**
**Niue Ridge to Reef Project**
**2019**

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***Working together to protect the people and the environment***

# INTRODUCTION

Environmental education for sustainability (EEfS)[1] is a lifelong process vitally important to Niue and its future. Like all countries around the world, Niue faces complex environmental issues. It is critical that students learn how their individual and collective behaviour affects the environment and how environmentally responsible lifestyles can contribute to healthy, sustainable ecosystems.

Environmental education for sustainability is a broad concept that helps young people understand the nature and complexity of environmental challenges and builds their capacity to take appropriate action. It is generally thought to have three components: environment, society and economy which are intertwined, not separate. All students should understand both how and why the environment has an impact on their daily lives, what kind of impact their daily lives can have on the environment, and what role they can play for creating a sustainable future.

Environmental education for sustainability acknowledges what has always been true:

> *That how people perceive and interact with their environment (their worldviews) cannot be separated from the society and the culture they live in*[2]

The Guidelines aim to assist Niue teachers to plan and implement teaching and learning programmes that focus on environmental education for sustainability and the requirements of *The Niue Curriculum*, including the vision and expectations for all students.

When students leave school, they should have an understanding of, and concern for, stewardship of the natural environment, and the knowledge to contribute to ecologically sustainable development. Niue schools have a vital role to play in preparing their young people for this responsibility.

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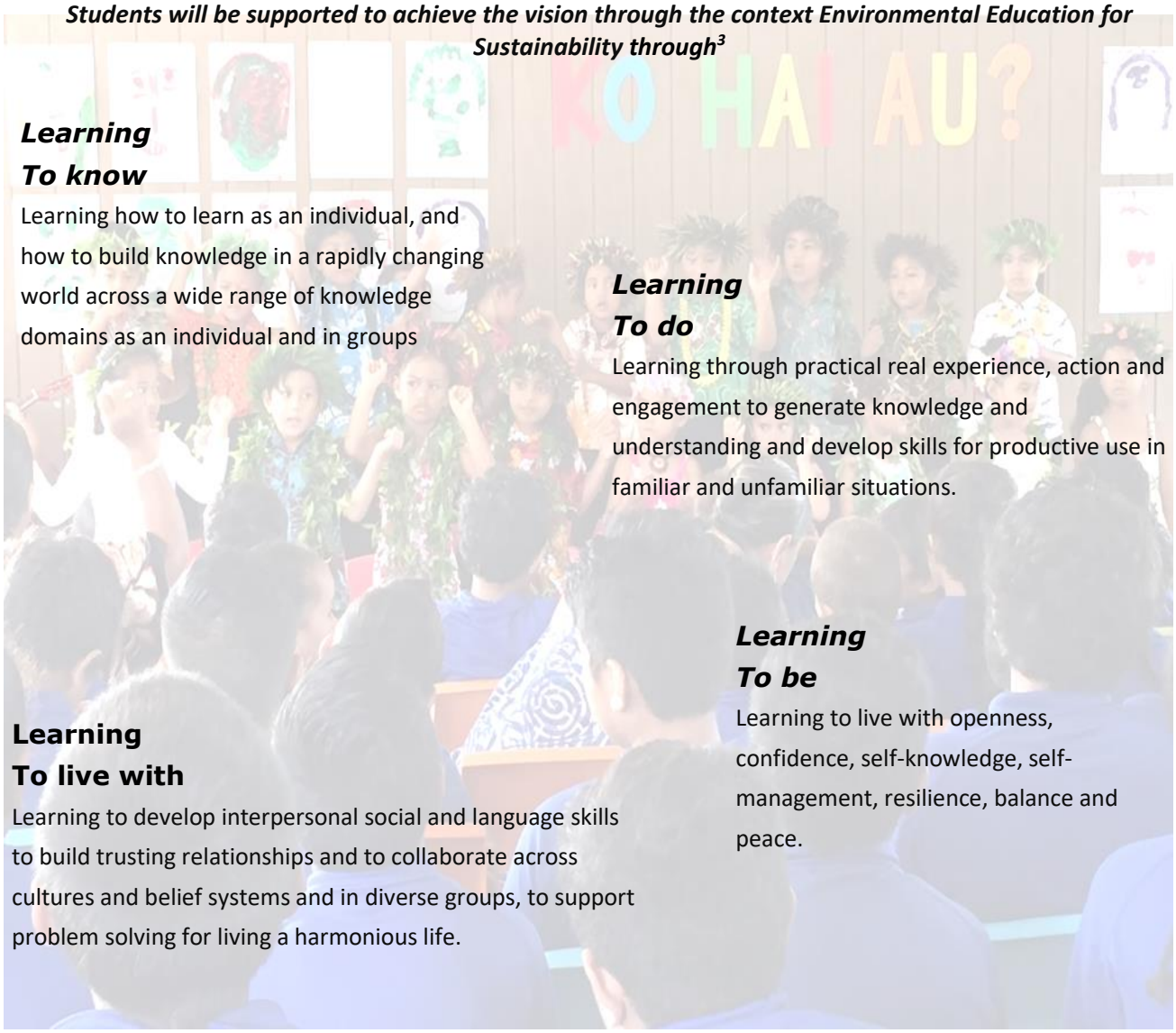
[1]Internationally this is often referred to as EEfS. Both the full name and the letters will be used in this document.

[2] From Parliamentary Commissioner for the Environment (PCE), *See Change: Learning and education for sustainability,* PCE, Wellington, New Zealand, 2004.

## *Niue's vision for all students*

***All students leave school having achieved to their highest potential, with respect for, and a strong understanding and appreciation of, Niue culture and Vagahau Niue, well prepared to pursue their future education, training and career choices, and to contribute to Niue's economic, social, cultural and political outcomes***

***Students will be supported to achieve the vision through the context Environmental Education for Sustainability through[3]***




### *Learning To know*

Learning how to learn as an individual, and how to build knowledge in a rapidly changing world across a wide range of knowledge domains as an individual and in groups

### *Learning To do*

Learning through practical real experience, action and engagement to generate knowledge and understanding and develop skills for productive use in familiar and unfamiliar situations.

### *Learning To be*

Learning to live with openness, confidence, self-knowledge, self-management, resilience, balance and peace.

### Learning To live with

Learning to develop interpersonal social and language skills to build trusting relationships and to collaborate across cultures and belief systems and in diverse groups, to support problem solving for living a harmonious life.

***Students will be supported to achieve the vision through the context Environmental Education for Sustainability***

[3]As stated in *The Niue Curriculum* and based on the report of the International Commission on Education for the Twenty-first Century, chaired by Jacques Delors, and published by UNESCO in 1996. It stresses that each individual must be equipped to seize learning opportunities throughout life, both to broaden her/his knowledge, skills and attitudes, and adapt to a changing, complex and interdependent world.

# THE IMPORTANCE OF ENVIRONMENTAL EDUCATION FOR NIUE

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 km in area it consists of a former lagoon surrounded by the remains of a reef rising to about 68 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. A fifth of its GDP comes from agriculture, fishery, forestry and hunting sectors. It is also the basis of subsistence lifestyles and has cultural significance.

Seventy percent of the country retains a cover of forest. Twenty three percent of it is in conservation areas, primarily the Huvalu Conservation Area.

The forest is home to three prized foods –

peka(fruit bats)

uga (coconut crabs) and

lupe (wood pigeons)

and has edible ferns, medicinal plants and minorwood products.

The environment provides and protects the groundwater aquifers which are the main source of drinking water for everyone on the island.

The document, Environmental Education for Sustainability, a resource booklet for teachers provides extensive information and is a significant resource for teachers to support them in the implementation of teaching and learning about Niue's environment.

Possible topics to focus on for teaching and learning programmes include:

- fresh water—allocation/quality/ sustainability/accessibility / location
- land use—contamination/resilience /issues
- marine—fishing sustainability, pollution, economics/risk to tourism
- climate and atmosphere—adaptation to changing climate (e.g., rising sea levels) and climate change mitigation
- air—quality
- forest—habitat, usage of trees, medicinal plants
- agriculture—what is farmed and how

Providing students with information only is insufficient to achieve the outcomes of environmental education for sustainability. For students to understand the nature and complexity of environmental challenges and have the capacity to take appropriate action teachers will have to help their students how to think and take action.

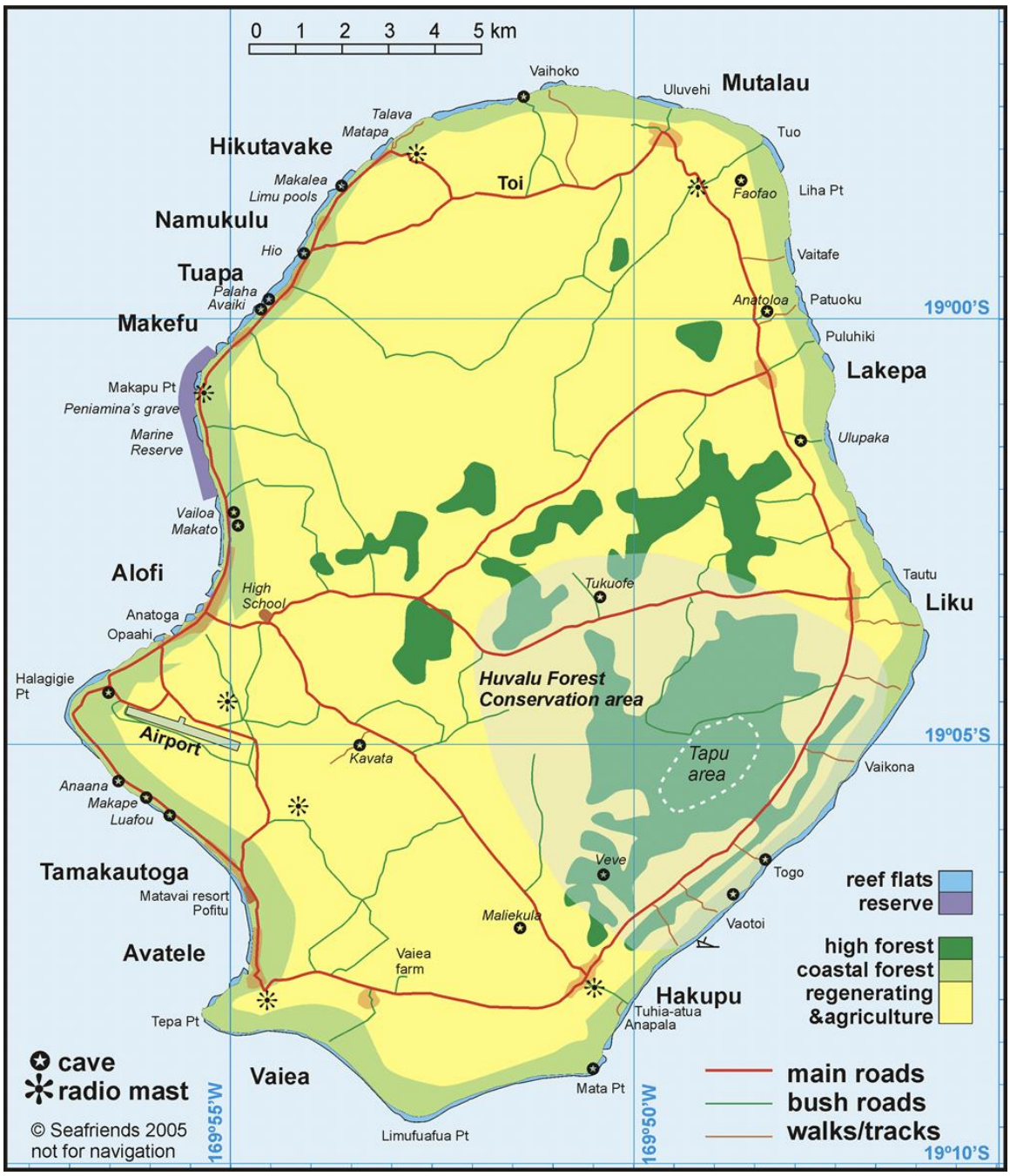



Figure 1. Map of Niue

## THE GOVERNMENT OF NIUE'S POSITION

The Government of Niue demonstrated its commitment to building a prosperous Niue through its Niue National Strategic Plan 2016-2026. The vision in the Plan, Niue ke

Monuina, is for a prosperous Niue where opportunities are created for the 'Niue People to lead healthy, prosperous lives while protecting the environment and its marine life, flora and fauna'[4].

The Plan has seven National Development Pillars, including the Pillar, Environment, which states the importance of sustainable use and management of the resources and environment for now and the future. The Government's mission, Working Together to Protect the People and the Environment, signals that everyone has a part to play in in securing a prosperous future for Niue.

A key tool to achieving this outcome is through education5. Education plays a crucial role in raising everyone's awareness of environmental challenges and shaping the attitudes and behaviors that make a difference. In Niue schools, young people can learn the knowledge and skills needed to make informed choices, actions and innovations by understanding environmental issues so that they can actively create, and contribute to, a healthy, sustainable and productive future for all.

[4]From Niue National Strategic Plan, 2016-1026.
[5] A key project in raising awareness and actioning actions has been the Ridge to Reef (R2R) project in Niue. This project has accumulated many significant resources that are useful for schools.

## WHAT IS ENVIRONMENTAL EDUCATION FOR SUSTAINABILITY?

Environmental education is not a new curriculum learning area or subject. In the 1960's and 1970's people concerned about the environment looked to science for answers. It soon become apparent that environmental issues could not be addressed in isolation. A more integrated position was wanted to promote long-term environmental, economic, and social sustainability which led to the approach that environmental education should comprise three dimensions:

education ***in*** the environment

education ***about*** the environment

education ***for*** the environment

that promotes an understanding of the relationship and interaction all people have with food, water, energy, air and land

Environmental education for sustainability helps students grow their understandings and skills, and motivates them to work with others to develop solutions, act as guardians, and advocate for taking better care of the environment.

It provides a thematic or topic opportunity for teachers to apply the various aspects of the curriculum. To achieve the goal of sustainability, teachers should make the learning relevant to their students' surroundings, be action-oriented where possible and ensure that it is culturally appropriate.

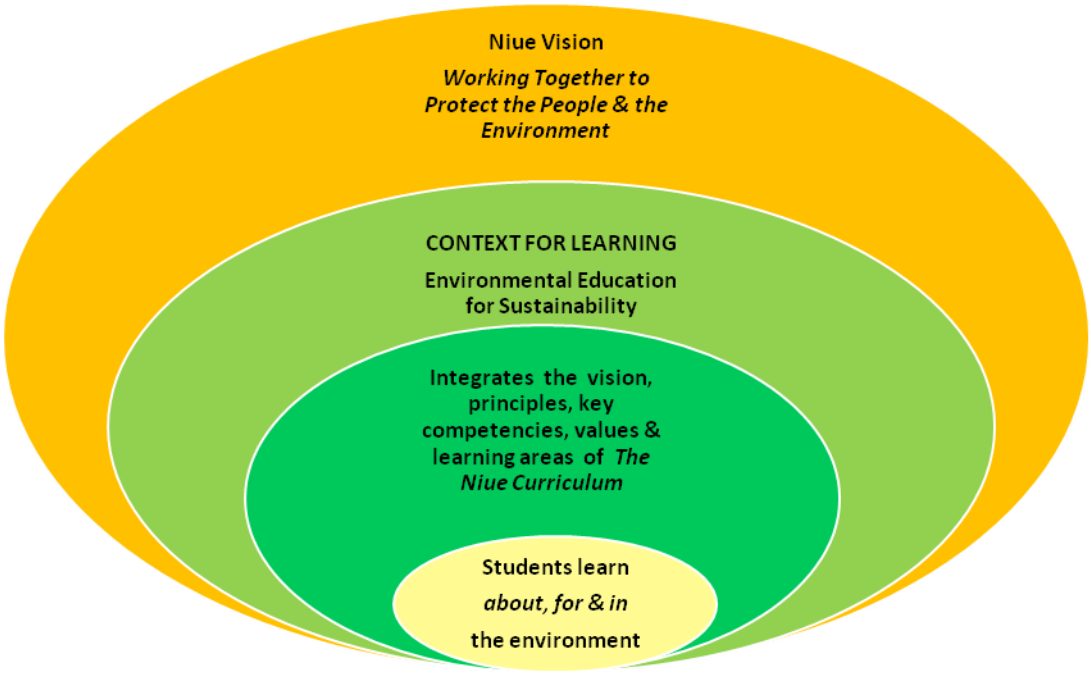
By participating in environmental education for sustainability studies, students learn how to think, not only what to think. Through integrating environmental education into curriculum learning areas, educators can also differentiate instruction, engage less motivated learners, and challenge students who are ready to go further and take action for the benefit of the environment on and around Niue.

Environmental education for sustainability in schools should result in students:

- participating in active sharing and collaborating with others at school, across Niue, and in their villages

- growing their knowledge and understanding about the environment and applying new thinking to environmental challenges
- developing new values and attitudes of concern for the environment.

The following diagram shows the integration of environmental education into active learning in schools.




Young people will learn the challenges inherent in getting people to take responsibility for own actions and properly care for the environment. Sometimes there are pressures and issues that impact on what individuals or villages can achieve. This is an important learning outcome for young people but a key message is that it is still important to be a caretaker for the environment.

Environmental attitudes and commitments, the development of critical thinking skills and learning how to work collaboratively are important outcomes for all young people. This means that EEfS provides a context that has implications for not only what is learnt but also how it is learnt. The Niue Curriculum outlines the kinds of teaching approaches that have a positive impact on student learning.

**Environmental Education for Sustainability is a shared reasonability. Students, teachers, leaders, families, villages all have roles to play and information to share.**

## WHY LEARN ABOUT ENVIRONMENTAL EDUCATION

While there is growing concern about our environment, we are often confused about what it means for us. Daily there are references to environmental issues such as climate change, ozone depletion, loss of biodiversity, pollution.

There is a strong view that we should be developing responsible attitudes towards caring for the environment. Through integrating environmental learning within the curriculum areas there is an opportunity to promote a change in attitudes by providing students with learning experiences relevant to them on Niue to understand the issues.

Education about, for and in the environment provides students with opportunities to learn about the functioning of the natural systems, to identify their beliefs and opinions, consider a range of views, and ultimately make informed and responsible choices for themselves, their families and villages.

However, a note of caution is needed. Students must not feel that solutions are beyond them and their actions do not matter. For example, climate change is a global challenge. The emphasis should be on helping students become critical thinkers, who learn to understand the science behind the issue and are able to connect their daily decisions to long-term consequences not just for themselves but for Niue.

The benefits to Niue's future as envisaged in the Niue National Strategic Plan 2016-2026 where opportunities are created for the 'Niue People to lead healthy, prosperous lives while protecting the environment and its marine life, flora and fauna'6 are enhanced with students participating in environmental education for sustainability teaching and learning experiences.

[6]From Niue National Strategic Plan, 2016-1026.

## LINKS TO THE NIUE CURRICULUM

These Guidelines address some of essential learnings outlined in The Niue Curriculum that all Niue students should leave schooling with an understanding of, for example [7]:

- The physical environment of Niue and how people interact with the landscape and the sea
- Environmental issues, conservation practices and the modification of the environment for better economic purposes such as the use of hydroponics
- Social, cultural, political and belief practices and systems
- Role and responsibility, and work opportunity, available to them now and in the future to sustain quality living on Niue for all.

In The Niue Curriculum there is a section, The Curriculum in Action, which provides an overview on how the Curriculum can be implemented to address environmental education for sustainability. The Curriculum states that students will learn about:

- the environment – water, land, ecosystems, energy, waste, urban living, transportation
- the interactions between the natural environment and human activities, and the consequences of these
- the choices and actions we can take to prevent, reduce, or change harmful activities to the environment.

EEfS is a valuable resource to focus on important learnings about the environment and how students could be empowered to think and act in ways for sustainable future for Niue and places beyond Niue.

An integrated approach towards environmental learning is preferred because many curriculum learning areas and topics touch on environment topics or experiences in some way. This models for students how the environment is connected to their daily lives. It is hoped that students will understand how their actions affect both local and global environments.

[7]These examples are from *The Niue Curriculum*. Teaching and learning programmes are not restricted to these essential learnings.

## IMPLEMENTING ENVIRONMENTAL EDUCATION FOR SUSTAINABILITY

The Niue Curriculum sets out how the curriculum planning is implemented on Niue. This activity is carried out through a curriculum team with the support of the leadership team. The curriculum team:

- adheres to what is important and desirable in learning and teaching programmes such as the social nature of learning and encourages well - organized small group work and reciprocal learning

- provides guidance for teachers on what should be taught and why, and how to integrate the values and key competencies

- puts the students learning at the centre of planning and teaching to engage, challenge and grow them in learning and as young people, including learning with technology

- makes sure that the learning programmes are inclusive and affirm Niue's unique identify, and connect well with learning areas, the community and the wider world

- supports coherence of learning within year levels and across both schools so learning progression is evident

- carries out moderation of learning outcomes at the conclusion of the teaching and learning to understand more about how well students are learning and where they are at across both schools.

Each syndicate and department is responsible for the detail in each unit /topic /theme that will be taught in their classroom. Teachers should note that the basic characteristics of planning to promote environmental education for sustainability include:

- identifying students' prior experiences, knowledge and competencies from their own lives and previous learning experiences and matching the new experiences to prior experiences

- identifying the key concepts across the learning areas and knowing which processes to apply to the learning experience

- embedding the learning in their surroundings as a frame of reference and building up the impact of environmental issues and opportunities for all students to have positive outcome

- deciding where to place assessment emphasis and what the assessment activity will be.

A key outcome in an effective EEfS programme is giving students opportunities for participation and action that will help them to create a sustainable future, the 'so what' focus at the end, which aligns with the Government's vision.


*TĀNAKI ~ LEVEKI ~ PUIPUI ~ ANOIHA*

*"Kaufakalataha ke Leveki e tau Tagata mo e Takatakaimotu"*
*"Working Together to Protect the People and the Environment"*

*Tanaki - to gather, collect & store*

***BUILD***

*Leveki*–to guard, to watch over

***PRESERVE***

*Puipui – to protect & look after*

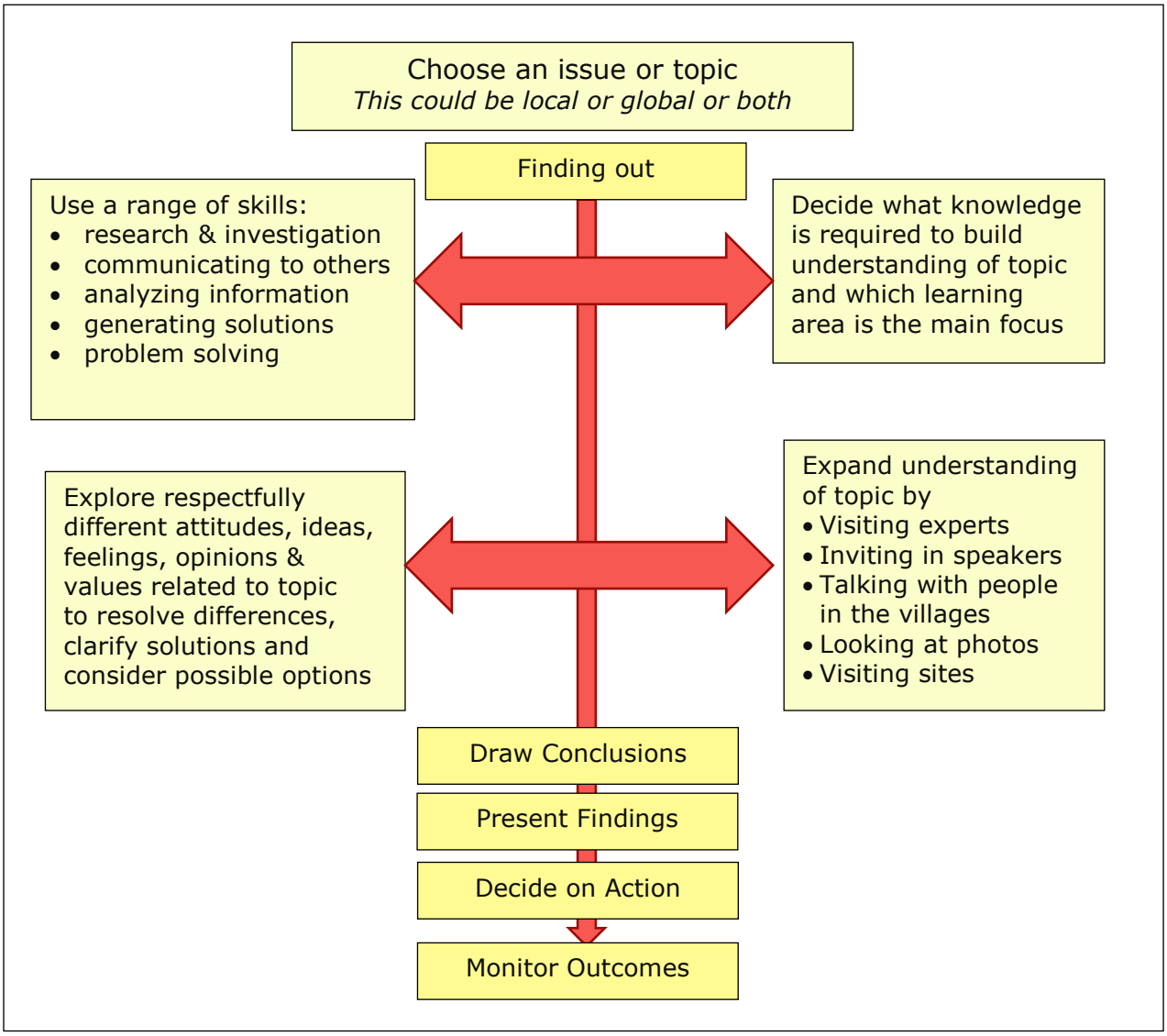
***PROTECT***

*Anoiha* - for times to come

***FOR THE FUTURE***

***Example of planning***

The following diagram describes an inquiry learning or action-oriented planning approach to environmental education for sustainability.




## LEARNING STRATEGIES

The aim of any learning experience is to support our young people to learn how to live smarter to reduce our impact on the environment for future generations on Niue.

Appropriate learning strategies for EEfS place the student at the centre of learning, are negotiated with students and are highly interactive within and beyond the classroom.

The following examples of strategies are associated with EEfS and are rarely mutually exclusive. They may overlap or interrelate with other strategies, depending on the unit, topic and year level of the student. Teachers should be mindful that the process or strategy requires new knowledge from the learning areas for students to build their understandings to preserve and protect their environment for the future.

| | |
|---|---|
| STORYTELLING | Learning through storytelling is an entertaining and interesting strategy to engage students at any stage of the learning process. Stories can come from different sources, including the internet. Storytelling is also an important way to involve elders from the village.<br>Older students could create story books for younger children on a topic or issue to develop their understanding. |
| CREATIVE THINKING | A range of techniques can be used to explore environmental issues, generate possibilities and look for possible solutions.<br>Developing students' creative thinking skills helps students develop a vision for a sustainable future.<br>A good starting place could be the Hikulagi Sculpture Park, a park established to demonstrate global environment concerns |
| EXPERIENTIAL LEARNING | Sometimes called learning by doing, or hands-on learning, experiential learning engages students in building knowledge, skills and values from direct experience and in contexts that are important and relevant to them.<br>Through feedback, reflection and critical analysis students can apply ideas and skills to new situations.<br>Experiential learning takes many forms, ranging from scientific predict–observe–explain situations to drama and creative art. Experiences outside the classroom are also important. These can include participating in activities around the island. |
| VALUES CLARIFICATION & ANALYSIS | Dealing with controversial issues in a balanced and sensitive manner is one of the greatest challenges for teachers. Values clarification is an approach that encourages students to analyse their own thoughts and feeling about an environmental issue, while values analysis encourages students to think about and analyse a range of perspectives in relation to their own.<br>Students can be encouraged and enabled to explore concepts of spirituality and |

| | |
|---|---|
| | sacredness of place and the stewardship of finite resources. |
| FUTURE PROBLEM SOLVING | Through this strategy students develop skills for analysing an environmental problem. Working through an issue stepby step can help them decide, from a futures perspective, what can be done about the problem. |
| INQUIRY LEARNING | Inquiry learning encourages students to respond to their own concern or curiosity and to investigate and act on an environmental issue. Students are encouraged to think through and solve problems associated with that issue. They are responsible for collecting and analysing data in order to reach their own conclusions and to decide on appropriate courses of action. A model is provided on page 14.<br>All strategies mentioned above in this table can be integrated into an inquiry. |

Assessment is an integral part of curriculum planning—effective assessment will serve diagnostic, formative and summative purposes. Effective assessment strategies need to be congruent with the different approaches to curriculum planning and content being adopted in an environmental education for sustainability program.

EEfS is an appropriate context for senior students in the High School. Students at Years 12 and 13 can gain NCEA credits through Environmental Education achievement standards and also gain University Entrance (UE) at Year 13, Level 3 NCEA. Students can also gain NCEA credits through studying EEfS in a broad range of subjects, including geography, biology, physics, graphics, outdoor education, music and science.

Environmental education for sustainability programmes have skills, attitudes and values, and participation and action as well as knowledge outcomes. This means assessment strategies will need to emphasize problem-solving, teamwork, decision making, holistic thinking, clarifying and analyzing values, and opportunities for action, as well as providing opportunities for students to present findings, reports, carry out a performance and make speeches.

## LEARNING EXPERIENCES

The following table provides some examples of topics/issues and learning experiences and suggested links to the Curriculum. Most learning experiences would have links to English and Mathematics. Vagahau Niue is not included as the language would be threaded across the learning experience.

| Topic / Issue | Learning experience | Curriculum link |
|---|---|---|
| **Waste** | What is waste?<br>How does Niue dispose of waste?<br>Changing waste into art form using sculptural ideas | Science<br>English<br>Social studies<br>The Arts |
| **Gardens** | Ongoing maintenance of school gardens | Science,<br>Mathematics |
| **Using local resources** | Students learn how to adapt the making of traditional baskets for everyday use | Technology<br>The Arts |
| **Coral bleaching** | What is coral bleaching? Is it a problem for Niue?<br>What other dangers exist for the reef?<br>What practices need to change | Science |
| **Retail Eco-friendly audit** | Examine how students daily habits impact on Niue's environment. What did they buy that week? How is their lunch packed? What do you buy from the supermarket that is needed at home? Are any of those products a problem for the environment, for sea animals, of for themselves? | Science<br>Social Studies<br>Technology<br>English<br>Mathematics |
| **Pollution on Niue** | Find out the extent of Niue's pollution issues.<br>What action can be taken? What can one student do?<br>For example:<br>What happens to paints, used oil, chemicals, spilled brake fluid, and so on | Science<br>Social studies |
| **Niue's drinking water** | Where does Niue's drinking water come from?<br>How is the water protected from pesticides and fertilizers and other contaminates? | Science<br>Technology |

| | | |
|---|---|---|
| **How safe are the fish to eat?** | Find out about fish health?<br>What can change in the sea to cause fish problems?<br>Explore changes in the ecosystem that impact on fish? | Science<br>Social Studies |
| **Peka / Fruitbats** | What do we know about the Fruitbats?<br>How do we protect them?<br>Is that sufficient to ensure their survival? | Science<br>Social Studies |
| **Keeping the ocean safe** | What practices does the Niue Government take?<br>What can villages and individuals do?<br>What practices should be discouraged?<br>How important are the whales to Niue? How important is the destination of Niue to the whales?<br>What is done to protect them when they visit each year? | Science<br>Social studies<br>Mathematics<br>English |
| **Threats & diseases** | What pests and diseases are problems on Niue?<br>How does Niue protect its borders? | Science<br>English<br>Social Studies |

Teachers have access to a comprehensive resource Teaching Framework & Lesson Plans: Biodiversity in Niue, an education kit for primary school (years 5-6). This resource was prepared by Landcare Research NZ Ltd and provides excellent templates, information that links to the Science Living World Strand. Teachers could adapt the lessons, and this resource could be the heart of many learning activities /topics /themes for EEfS.

An Expanded Learning Experience Example 1: Plastics Pollution

By studying the topic, Plastics Pollution, students will learn about the the choices and actions they can take to prevent, reduce, or change harmful activities to the environment. Students will be encouraged to reflect on how much plastic they use, how they can reduce consumption and the impact on Niue, an island in the Pacific.

The topic links well to English, Mathematics, Science, Technology and Social Studies and The Arts.

**Background Information**

Whether you take a stroll around your village, near your school or along the coastline there's a good chance that there will be some plastic pollution along the way. Around the world there are billions upon billions of items of plastic waste choking oceans, lakes, and rivers and piling up on land. Plastic waste is unsightly and harmful to plants and wildlife. Plastic pollution is very real and single-use plastics are small but have a large impact. Straws, plastic water bottles, and plastic bags belong to a group of materials known as single-use plastics.



***If nothing changes, it is estimated that by 2050 there will be more plastic in the ocean than fish.***

Here are some facts that show how pervasive single-use plastics have become around the world.

| | |
|---|---|
| **FACT #1** | In 2016, world plastics production totalled around 335 million metric tons. Roughly half of annual plastic production is destined for a single-use product. |
| **FACT #2** | Humans buy about 1,000,000 plastic bottles per minute in total. Only about 23% of plastic bottles are recycled within the U.S. |

| | |
|---|---|
| **FACT #3** | Americans purchase about 50 billion water bottles per year, averaging about 13 bottles per month for every person in the U.S.! That means by using a reusable water bottle, you could save an average of 156 plastic bottles annually. |
| **FACT #4** | It is estimated that 4 trillion plastic bags are used worldwide annually. Only 1% of plastic bags are returned for recycling. Americans throw away 100 billion plastic bags annually. That's about 307 bags per person! All that waste can be eliminated by switching to reusable shopping bags. |
| **FACT #5** | Half a million straws are used in the world every day. Refusing straws is becoming a trending practice! |
| **FACT #6** | 500 billion disposable cups are consumed every year. Americans alone throw away 25 billion styrofoam coffee cups every year. Styrofoam cannot be completely recycled. Most of the Styrofoam disposed of today will still be present in landfills 500 years from now. |
| **FACT #7** | The main cause for the increase in plastic production is plastic packaging. Plastic packaging was 42% of all non-fibre plastic produced in 2015, and it also made up 52% of plastics thrown away. |
| **FACT #8** | Single-use-plastics frequently do not make it to a landfill or are recycled. A full 32% of the 78 million tons of plastic packaging produced annually is left to flow into our oceans; the equivalent of pouring one garbage truck of plastic into the ocean every minute. This is expected to increase to two per minute by 2030 and four per minute by 2050. By 2050, this could mean there will be more plastic than fish in the world's oceans. Choosing to buy products with less packaging or no packaging altogether makes a big difference. |
| **FACT #9** | Even when single-use plastics are sent to landfills (there are 3,091 active landfills in the U.S. alone), they aren't harmless. Landfill liners can leak harmful pollutants into the watershed and plastics on the tops of landfills can be carried away by the wind. The best way to curb single-use plastic pollution is to reduce your personal plastic consumption! |

***Did you know?***

When plastic collects in our oceans, it can harm and kill marine life by strangling or choking animals. Marine life often mistake plastic bags for food such as jellyfish. Plastic bags once ingested, cannot be digested or passed by an animal and the plastic remains in the gut. Over time, large plastic degrades into small particles known as microplastics, which have the potential to release toxic chemicals. And become part of the food chain.

Plastic in the oceans can collect in "garbage patches," the most famous of which is the Great Pacific Garbage Patch (which is twice the size of Texas!). These garbage patches are not solid masses of plastic, or even whole items like plastic straws and bottles. Instead, they are mostly made of microplastics.

The ocean is not the only place microplastics are showing up. Scientists have found microplastics in our soil, tap water, bottled water, and even in the air. Some studies have suggested that there are more microplastics on land than there are in our oceans. Microbeads found in cosmetics are washed down the sink and clothing fibres from the washing machine end up in sewage sludge. Organic fertilizer from composted food can also become a source of plastic pollution despite efforts to remove plastic contamination.

The Ocean Conservancy's 2017 Coastal Cleanup Report[8] complied data from beach cleanups around the world. It found that the most common trash item found on beaches is cigarettes, followed by plastic bottles, bottle caps, wrappers, and bags. Straws and stirrers placed seventh on the list.

On July 2018 Niue banned single-use plastics. Niue decided that it would need 12 months to wean itself off the use of plastics. All households were to be provided with substitute bags, reusable organic bags.

***What can you do?***

These are a list of activities to stimulate teachers thinking about what students can do, how to make the activity relevant for the year level and link to the appropriate learning area, achievement objectives and competencies.

**What actions can students take?**

Saying "no" to single-use plastic is one way for students to get involved in the problem of plastic pollution. How could they do that?

**Actions**

[8] https://oceanconservancy.org/wp-content/uploads/2017/06/International-Coastal-Cleanup_2017-Report.pdf
The International Coastal Cleanup is the world's largest volunteer effort for the ocean and waterways.

Plan a litter collection activity or even a day for the whole school or village.

The class can be active by collecting litter as a class on school grounds or in Alofi. You could also join forces with other classrooms, get the whole school involved, or even work with villages to spread the word and take part in a bigger cleanup.
Students can keep a tally of the different single-use plastics they collect and determine how much can be recycled.

Older students can use their information to write an article for Niue News on television and radio, or send letters to the Niue Government, and or hold Information Days on progress Niue has made to phase out single-use plastic..

Create posters to distribute around the island.

Encourage students to spread the word about what we all can do to reduce or eliminate the single-use plastic products in our lives.

To help them understand possible alternatives, explore the differences between renewable and non-renewable resources. Then have students make posters or signs for school and at home to serve as a reminder of why it's important to reduce our plastic consumption and what alternatives are available.

The posters could include facts, photos, comics, or memes – whatever they think will inspire people to think twice and change their habits!

Keep a journal /wall chart in the classroom of single-use plastics.

Design tee shirts and shopping bags that have key messages on them. Students could learn how to design, make and market these items.

Find out how many families use kato tapola, cloth bags or sacks.

Celebrate Niue's success and send information around the world.

**Discussion topics**

Ask students to reflect on their experiences doing the cleanup.

- *What was it like to see all the trash in around the school, village and coast?*
- *Was there anything you found that we could recycle or stop using entirely?*
- *What are some ways you could make a difference in reducing plastic pollution and keeping the schoolground and island free of plastic rubbish?*

Older students can reflect on this statement:

"Nothing we use for a few minutes should be allowed to pollute our oceans for hundreds of years – especially items we don't really need".

Research the pros and cons of using plastic - carry out an inquiry as part of their social studies programme.

***In 1907 plastic was dubbed "the material of a thousand uses" by Leo Baekeland, the inventor of the first completely synthetic plastic.***

Every choice we make has trade-offs. Some plastics are beneficial and life-saving and others are potentially unnecessary and contribute to the pollution of our environment.

Students can make a poster or presentation showing all the ways we benefit from using plastic and how it can potentially harm the environment.

- *Are there any plastic products where the benefits outweigh the possible negative environmental impacts?*
- *Are there any plastic products we might be able to reduce or eliminate? What do we do with plastic at the end of its life?*
- *Is recycling a good option for the different types of plastics? Why or why not?*

Students can examine the pros and cons of different packaging strategies, and suggest design or material improvements to resolve problems they identify. This would be a great opportunity to find out what challenges Swanson's Supermarket faced when phasing out single use plastics.

Students can research and analyse the energy and materials – including single-use plastic – that go into making a favourite object.

Students keep a journal of the single-use plastics they use over the course of a week (they could even include their whole family in the process!). They will likely be surprised to see how many times plastics are used in packaging. To take it a step further, ask students to collect all the single-use plastic products they used throughout the week and bring their collection to class at the end of the week. That type of visual can make a big impression on students and would be a great discussion starter.

Students could also create an art piece with the plastic they collected throughout the week to make a statement that the whole school or community can see.

Where does all the plastic go on Niue? Will it do more harm to the environment where it is dumped? This would be an excellent follow up and address the key learning outcome of the activity, so what?

Make a pledge. Students could consider making a pledge for themselves and for the environment. Choose one single-use plastic that they will try to avoid using now and in the future. Students could keep a journal to show how they are keeping their pledge.

***An Expanded Learning Experience Example 2: The Mosquito Story[9]***

By studying the topic, The Mosquito Story, students will gain a better understanding about dengue fever and zika prevention and control;the part the environment and the mosquito play in this disease; and what they can do to help eliminate the problem.

[9] From the Mosquito Bundling Protocol at GLOBE

***Did you know?***

Pathogens spread by mosquitos kill more than a million people a year across the world, mostly in tropical regions. Increasing temperature and rainfall are potentially providing suitable conditions and habitats for mosquitos to spread pathogens, however, climate alone is not enough. The mosquito has already hitchhiked to Europe and North America with eggs attached to used tires and bamboo. Movement of people, not shifts in climate, is the biggest risk.

You can make a difference in tracking and controlling the spread of mosquitos and help save your loved ones from getting dengue, zika and other illnesses.

***What Science tells us?***

Concerns regarding the impact of global warming on vector-borne diseases, have intensified interest in the relationship between temperature and dengue fever and Zika incidences and include a focus on determining whether climatic factors alone can be used to indicate or predict variations in dengue and Zika incidences. However, even if epidemiological surveys show that in endemic situations trends in incidence are generally driven by variations in seasonal climate, these changes in incidence depend on many parameters and the impact of temperature alone cannot be isolated easily from that of other climatic factors (e.g., rainfall, relative humidity).

In the last 50 years, there has been a thirtyfold increase in mosquito-borne diseases as well as geographical expansion of incidences to new areas and countries, particularly in rapidly expanding urban and semi-urban places in middle- and low-income countries where water storage and waste disposal services are limited. An estimated 50 million dengue infections occur annually and about 2.5 billion people live in regions with the potential risk of dengue transmission.

Global climate change poses the threat of serious social upheaval, population displacement, economic hardships, and environmental degradation. Human health could be influenced by increased variability and sustained climate changes. The ecology, development, behavior and survival of mosquitoes and the transmission dynamics of the diseases they transmit are strongly influenced by climatic factors (i.e., precipitation, temperature, relative humidity, wind, storm severity, frequency of flooding or droughts and rising sea levels). Changes in temperature, rainfall and relative humidity have potential to enhance vector development, reproductive and biting rates, shorten pathogen incubation period and encourage adult longevity. In addition, changes in wind direction, velocity and frequency will have an impact on adult

mosquito populations, affecting dispersal, survival and aspects of the general behavior of many species. The complex interplay of all these factors determines the overall effect of climate on the local prevalence of mosquito-borne diseases.

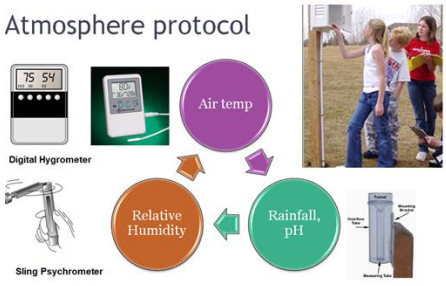
## Learning Possibilities


**Indoor/outdoor containers.** Students can compare the number of mosquito larvae in indoor and outdoor containers, the number of positive containers that mosquito species found indoors versus outdoors? Would water pH, temperature, and turbidity in indoor and outdoor containers differ? Would some mosquito larvae specie be more abundant in water with lower pH than with higher pH**?**


**Containers with lids and without lids.** Some houses put lids to cover their water containers. It would be interesting to show that mosquito larvae were higher in containers without lids than with lids. **S**tudents can demonstrate this to their villages to raise community awareness.


**Dark/light containers.** Is it a myth that mosquitos prefer darker cloths, darker corners of the house? Students can prove this by showing water container colors and dark/light have some effect on mosquito females when they choose to lay their eggs.


**Earthen/Plastic containers and Natural/artificial containers.** Urbanization is a global phenomenon and we have to admit that plastic containers come with urbanization. Students could monitor how people in their area have changed from using earthen and natural materials to plastics. You would be surprised that mosquitos also have changed their habit and preferences by laying eggs more in plastic containers than earthen jars. Students can check if mosquito females in their area have changed their habit and prefer to lay eggs in plastic containers.




**Atmospheric factors.** Several studies have shown that monthly max/min/mean temperature, min/mean relative humidity, max/mean wind speed, monthly rainfall, daily max rainfall, rainy days, cloudiness, and visibility were positively associated with monthly dengue incidence. So for students, it would be interesting to explore what atmospheric factors are positively associated with dengue incidences in their village. This would help raise awareness in their local community on dengue outbreaks when atmospheric factors meet certain criteria.

The prevalence of mosquito borne diseases is expected to increase across the world as temperatures increase. This could mean higher rates of dengue, zika, malaria and other illnesses.

Monitoring the mosquito, recognising breeding places and understanding how changes in the weather contribute to an increase in mosquito numbers would be valuable learning experiences for the students.

***What actions can students take?***

The Mosquito Story would make an appropriate inquiry learning or action-oriented activity for students.

- *Students could interview Health officials to know the extent of the problem and what actions they could take to reduce the problem.*

# GLOSSARY

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|---|---|
| **Biodiversity** | Biodiversity is the variety of all life on earth – plants, animals, and micro-organisms, the genes they contain, and the ecosystems they form. |
| **Conservation** | Conservation is the careful use, protection and management of ecosystems, heritage and natural resources to ensure their long-term viability. It is different from *preservation* which refers to maintaining a pristine state of nature as it is or might have been in the past before any human intervention. |
| **Ecology** | The relationship between living things and their environments |
| **Ecosystem** | A network of interactions linking all living organisms with non-living parts of the environment such as water, air and soil. |
| **Environment** | Physical surroundings, circumstances and influences affecting people's lives and development |
| **Ethics** | a set of moral principles, our beliefs about what is wrong and right behaviour |
| **GDP** | Gross Domestic Product. GDP measures the value of economic activity within a country during a period of time |
| **Interdependence** | People are an inseparable part of the environment and we are part of a system that connects individuals, their culture and their natural surroundings |
| **Stewardship** | The responsibility of being a caretaker or custodian of the environment by managing activities with due respect for the health of the environment. It means taking care of what we have not only for ourselves, but for those who come after us. |
| **Sustainability** | The concept of managing resources or activities so that they are never exhausted |
| **System** | a set of things or parts connected or associated in an orderly arrangement according to some plan |