



SCHOOLS FOR A HEALTHY ENVIRONMENT

INTERDEPENDENCE

Module 5

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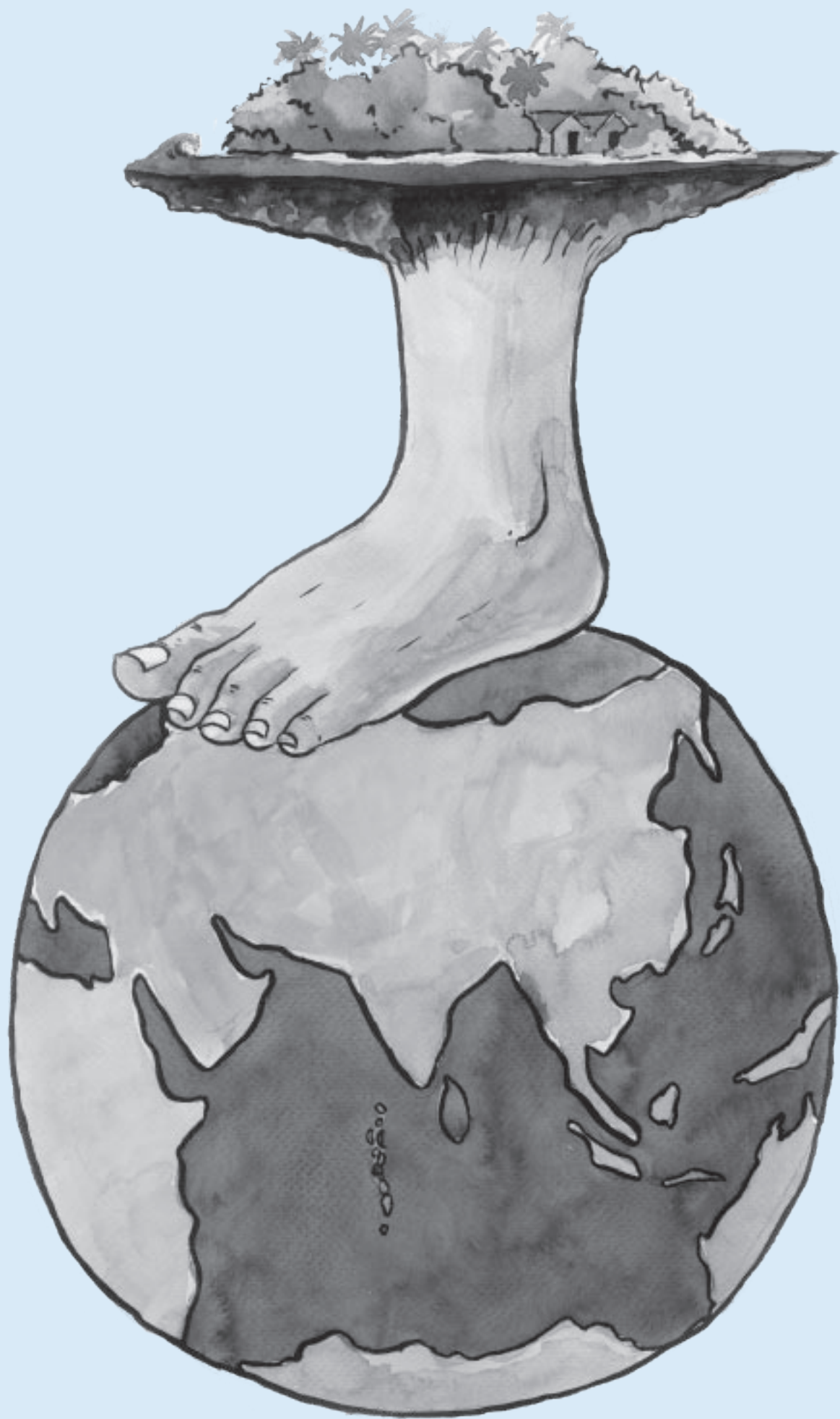
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INTRODUCTION

This Module is designed to be used by teachers and facilitators during relevant school and/or Environment Club activities. Each Module provides the curriculum linkages which would help the teachers in choosing activities when planning the lessons during the weekly meetings. Each section of the Module follows the similar format of a seven step inquiry model. The inquiry model is chosen to be followed in the activities because this method focuses on student centred learning. When applying the steps of the inquiry model the teacher will act as a facilitator and the students will:

- gain a deep understanding of the subject matter
- develop thinking and reasoning skills
- develop problem-solving skills
- have their intellect challenged
- take greater responsibility for their own learning
- understand the relationship between what they are studying and the real world
- have varied and interesting learning experiences

The seven steps used in the Inquiry Model are as follows:

1. Tuning In
2. Deciding Directions
3. Finding Out
4. Sorting Out
5. Drawing Conclusions
6. Considering, Planning and Taking Action
7. Evaluation and Reflection

Each of the 6 Modules has been designed with subheadings for purpose, time, materials required and procedure. These subheadings have been included to guide teachers to plan and conduct the activities. The times provided with each activity are suggested times to help the teachers plan the class. This is a guide only; some activities may take less or more time. The inquiry process is based on developing critical thinking and problem solving skills, so the duration of activities should be related to the interest and development of the student's knowledge and skills. Each Module has also been designed with Student Resource Sheets and Teacher Information Sheets for each section, to assist in preparing for and conducting activities. Sample Student Resource Sheets have also been provided to guide teachers as to the kind of responses expected on each Sheet. Once again, this is offered as a guide and responses should not be limited to the suggested ones. Each Module has been written in plain English, however for some subjects it has been necessary to include more technical terms. A glossary has been included at the end of the Modules to explain these technical terms. Where possible photos and illustrations have also been included in each Module to explain or demonstrate specific activities.

These Modules are also accompanied by 2 toolboxes; one for indoor equipment and one for outdoor equipment. The toolboxes provide the physical materials needed to conduct the activities with the required materials being specified for each activity. The toolboxes also contain reference materials, posters and Flip Charts providing the necessary background for these Modules. The contents of the toolboxes and instructions for care and maintenance are included in the following pages.

OVERVIEW OF THE MODULES

There are 6 teaching and learning Modules in this series that are linked to themes in the Environmental Studies curriculum. Each Module provides instructions for a number of activities that might be used with a class to explore aspects of the issue that is being addressed. These Modules do not comprise a complete unit; rather they may be used to supplement other work being done within a topic area and what is found in the established syllabus.



Module 1: Ourselves

1. Island Environment
2. Traditional Knowledge
3. Environmental Impact Assessment
4. Common Diseases and Prevention



Module 4: Resources from the Environment

1. Energy used at School and at Home
2. Conservation, Management and Reuse of Water
3. Managing Waste
4. Reduce, Reuse, Recycle
5. Composting Waste



Module 2: Earth

1. Weather
2. Safe Drinking Water
3. Water Quality Monitoring



Module 5: Interdependence

1. Food Web
2. Exploring my Atoll
3. Ecological Footprints



Module 3: Life Around Us

1. Mangroves
2. Beaches
3. Coral Reefs
4. School Gardens



Module 6: Science and Technology

1. Wind Energy
2. Solar Energy

ENVIRONMENTAL STUDIES CURRICULUM LINKS

| | MODULE | SECTIONS | Grades 1 - 3 | Grade 4 - 5 | Number of lessons |
|---|--------------------------------|---|-----------------|----------------|----------------------|
| 1 | OURSELVES | Island Environment | | x | 3 - 4 lessons |
| | | Living by Traditional Knowledge | | x | 3 - 4 lessons |
| | | Environmental Impact Assessment | | x | 4 - 6 lessons |
| | | Common Diseases and Prevention | x | | 4 - 6 lessons |
| 2 | EARTH | Weather | x | | 4 - 6 lessons |
| | | Safeguarding Drinking Water | | x | 4 - 6 lessons |
| | | Water Quality Monitoring | | x | 4 - 6 lessons |
| 3 | LIFE AROUND US | Mangroves | | x | 4 - 6 lessons |
| | | Coral Reefs | | x | 4 - 6 lessons |
| | | Beaches | | x | 4 - 6 lessons |
| | | School Gardens | x | | 3 - 4 lessons |
| 4 | RESOURCES FROM THE ENVIRONMENT | Energy used at Home and School | x | | 4 - 6 lessons |
| | | Conservation, Management and Reuse of Water | x | | 4 - 6 lessons |
| | | Managing Waste | x | | 4 - 6 lessons |
| | | Reduce, Reuse, Recycle | x | | 4 - 6 lessons |
| | | Composting Waste | | x | 3 - 4 lessons |
| 5 | INTERDEPENDENCE | Food Web | | x | 3 - 4 lessons |
| | | Exploring My Atoll | x | | 3 - 4 lessons |
| | | Ecological Footprints | | x | 4 - 6 lessons |
| 6 | SCIENCE AND TECHNOLOGY | Wind Energy | x | | 4 - 6 lessons |
| | | Solar Energy | | x | 4 - 6 lessons |

TOOLBOX CONTENTS

| DRY KIT | | |
|---------|-------------------------------------|---|
| | Item | Details |
| 1 | Plastic vials/jars screw top | 100-300ml. |
| 2 | Hand lenses | Magnification x 3, lens diameter 90mm, plastic handle. |
| 3 | Long handled tongs | Jaws corrugated inside, length 150x200mm, stainless steel. |
| 4 | Insect catching nets | Hand net for insects, overall length 1.48m, diameter 250mm. |
| 5 | Plankton nets | Plankton net, nylon monofilament netting, with tough nylon collar, diameter 300mm, overall length 900mm, brass frame with 7m tow line and a PVC filter, aperture size 0.1mm and 0.3mm. |
| 6 | Thermometers | Mercury in glass, permanent amber markings, with anti-roll clip, range -10 to 110o Celsius, 6mm diameter with reinforced bulb, in plastic case. |
| 7 | Globe of earth | Rubber ball - globe of the earth, fully numbered meridian ring, diameter of globe 30 cm. |
| 8 | Twine | Brightly coloured nylon twine (20m). |
| 9 | Measuring tape | Sturdy, length 50m. |
| 10 | Measuring tape | Length 1 meter. |
| 11 | Student microscope | Monocular head rotates 360 degrees and has a 10x eyepiece. DIN 4x, 10x and 40x glass achromatic optics on the triple nosepiece. |
| 12 | Binoculars | Magnification 7x50, waterproof. |
| 13 | Litmus paper | Red and blue. |
| 14 | pH strips | Full Range pH from 1 to 14, colour reference chart with clearly printed pH values and instruction leaflet. |
| 15 | Low cost water monitoring kit | Provides simple and non-hazardous method of testing 8 basic water quality parameters: coliform bacteria, dissolved oxygen, BOD, Nitrate, pH, Phosphate, Temperature and Turbidity. |
| 16 | Water quality - H ₂ S | Bottle with hydrogen sulphide strip (H ₂ S water test kit). |
| 17 | Compass | 90 mm in diameter and 22 mm high, and graduated in easy-to-read increments, waterproof. |
| 18 | Measuring staff | Metre pole sections in red and white. |
| 19 | Jars with screw top lids | 500ml with wide lid. |
| 20 | Measuring containers | Clear plastic, capacity 1000ml, show divisions every 10ml. |
| 21 | Torch | Solar, kinetic, magnetic LED, waterproof. |
| 22 | Gloves | Cloth gloves (10 small and 10 medium). |
| 23 | Safety spectacles | Clear frames, should be able to wear over prescription spectacles. |
| 24 | Sediment sorting trays (3 sizes) | Diameter or length up to 30, Plastic sieve, aperture size 0.1mm, 0.3mm and 0.5mm. |
| 25 | Stopwatch | 0.1sec, 30sec, 15min dials, diameter 45mm, housed in a plastic case, water proof. |
| 26 | Garden fork | Children's garden fork with plastic handle. |
| 27 | Garden spade | Children's garden spade with plastic handle. |
| 28 | Solar cell educational kit | Comprises of Solar cell module, solar energy introductory booklet; Small DC motor, screws and nuts, wire with motor clips; colour spinner discs; paper aero plane and bird models; plastic turnables with 4 sizes, 5/82, 1.52, and 22; plastic fan spinner. |
| 29 | Weather kit | Australian Geographic Weather Watch kit, comprises of rain gauge, thermometer, wind speed indicator flap and measuring cylinder. (www.australiangeographic.com.au) |
| 30 | Coral watch kit | Coral watch reef education package, The University of Queensland, Brisbane, Australia. |
| 31 | Cubic metre set and corner inserts. | A set of three alternately coloured dm triangle metre sticks, nine blank triangle metre sticks and eight corner blocks for the construction of an accurate internal dimension cubic metre. |
| 32 | Spring balance | Spring scale, calibrated in grams (to weigh up to 50kg). |

| DRY KIT | | |
|--------------------------------|----------------------------------|--|
| | Item | Details |
| Identifications Guides: | | |
| 1 | Plastic cards | Plastic card set containing pictures and names of fish and other invertebrates. |
| 2 | Field Guide | Field guide to Maldivian Birds & Beach Ecosystems (2008). |
| 3 | Field Guide | Field guide to Maldivian Plants (2008). |
| 4 | Field Guide | Field guide to Maldivian Mangroves (2008). |
| Flip Charts: | | |
| 1 | Weather, Water, Waste and Energy | Weather, Water, Waste and Energy Flip Chart (2008). |
| 2 | Environment and Biodiversity | Environment and Biodiversity Flip Chart (2008). |
| Reference Books: | | |
| | Subject | Author, year of publication, title, publisher and ISBN |
| 1 | Biodiversity | Krys Kazmierczak (2000) <i>A field guide to the Birds of India, Sri Lanka, Pakistan, Nepal, Bhutan, Bangladesh and Maldives</i> , Gopsons Papers Ltd, ISBN 81-87107-04-9 |
| 2 | Biodiversity | Dr. R.C. Anderson, <i>Living Reefs of the Maldives</i> , Novelty Publishers, ISBN 99915-801-1-5 |
| 3 | Biodiversity | Dr. R. Charles Anderson, (2005), <i>Reef fishes of the Maldives</i> Manta Marine Pvt. Ltd, ISBN 99915-5401-7 |
| 4 | Biodiversity | National Centre for Linguistic and Historical Research, (2002), <i>Gasgahaagehi</i> , ISBN 99915-1-016-8 |
| 5 | Biodiversity | National Centre for Linguistic and Historical Research, (2001), <i>Dhivehi raajjeygai hedhey baeh meyvaa</i> , ISBN 99915-1-009-5 |
| 6 | Biodiversity | National Centre for Linguistic and Historical Research,(2002), <i>Maamelaameli</i> , ISBN 99915-1-025-7 |
| 7 | Traditional Knowledge | National Centre for Linguistic and Historical Research, (2004), <i>Dhivehi Raajjeyga Huri Aasaaree Thanthan</i> , 99915-1-063-X |
| 8 | Traditional Knowledge | National Centre for Linguistic and Historical Research, (2002), <i>National Museum</i> , ISBN 99915-1-016-8 |
| 9 | Traditional Knowledge | Naseema Mohamed and P.Ragupathy (2005) <i>Inscriptions of Maldives No 1</i> , National Centre for Linguistic and Historical Research, ISBN 99915-1-069-9 |
| 10 | Traditional Knowledge | Naseema Mohamed, (2006), <i>Essays on early Maldives</i> , National Centre for Linguistic and Historical Research, ISBN 99915-1-083-4 |
| 11 | Traditional Knowledge | Dr.Philos Egil Mikkelsen, (2000), <i>Archeological excavations of a Monastery at Kaashidhoo</i> , National Centre for Linguistic and Historical Research, ISBN 99915-1-013-3 |
| 12 | Traditional Knowledge | National Linguistic and Historical Research, (2006), <i>Vihivana garunuge thereyga Dhivehi Raajje 1</i> , Novelty press, ISBN 99915-1-061-3 |
| 13 | Traditional Knowledge | National Centre for Linguistic and Historical Research, (2006), <i>Vihivana garunuge thereyga Dhivehi Raajje 2</i> , Novelty press, ISBN 99915-1-084-2 |
| 14 | Traditional Knowledge | National Centre for Linguistic and Historical Research,(2006), <i>Vihivana garunuge thereyga Dhivehi Raajje 3</i> , Novelty press, ISBN 99915-1-085-0 |
| 15 | Traditional Knowledge | National Centre for Linguistic and Historical Research , (2006), <i>Vihivana garunuge thereyga Dhivehi Raajje 4</i> , Novelty press, ISBN 99915-1-069-6 |
| CD: | | |
| 1 | Hygiene and sanitation | UNICEF hygiene and sanitation TV advertisement clips |
| 2 | Biodiversity | Coral Watch Reef Education CD, in the Coral Reef Education Package (see above) |

WET KIT

| | Item | Details |
|---|---------------------|---|
| 1 | Snorkel | Colourful, snorkelling - Ordinary |
| 2 | Masks | Colourful, snorkelling - Small 8 , Medium 12 |
| 3 | Booties | Colourful, snorkelling - Small 5 , Medium 10, Large 5 |
| 4 | Footwear / Gumboots | Rubber footwear, gumboots |
| 5 | Kick boards | Swimming boards for children (ages 6-13) |



OPERATION AND MAINTENANCE OF TOOLBOXES:

- Toolbox Log – each time someone takes any equipment from the toolbox they should sign for which pieces they are using and sign again when they return them. An equipment log will be kept in each toolbox.
- Paper materials – it is important that books, posters, Flip Charts and pictures be kept in a dry place that is well aerated and free from insects. If these materials do get wet it is important to dry them immediately and not to put wet items back with the dry items.
- Outdoor equipment – if any equipment is used outdoors it is very important to ensure that it is clean and dry before it is put away. It is important to store this equipment in a dry, well aerated area that is free from insect or animal damage.
- Wet equipment – some equipment such as masks, snorkels, booties, etc are made for using in the ocean, but if you don't rinse them in fresh water after each use they will quickly become damaged. It is important to store this equipment in a dry, well aerated area that is free from insect or animal damage.
- Specialist equipment – some items don't just need care in storage they need skill in setting them up for correct use. Binoculars for example need to be calibrated for use – different people may need it adjusted for their eyesight.
- Damage – if items are damaged beyond use it may be possible to get replacement items from your local Teacher Resource Centre. They only have limited replacement items so keep your toolboxes in good order.

MODULE SUMMARY



This Module has been developed to complement the theme 'Interdependence' in the Environmental Studies curriculum. The Module focuses on the modern world. In the modern world, everyone, both individuals and nations alike, are dependent on one another, for political, economical or social factors. National, regional and international organizations have been formed for these purposes. Exchange of ideas and training in various fields such as fishing, agriculture and tourism has developed a close relationship among nations and communities. Furthermore trade and commerce plays a major role between developed and developing countries.

The table below depicts the toolbox contents needed for the practical application of this Module.

| Item | Details | Section |
|--|--------------------------------------|------------|
| Flip Charts | | |
| Environment and Biodiversity Flip Chart (2008) | General Environment and Biodiversity | 1, 2 and 3 |

1

FOOD WEB

Grades: 4 to 5

Number of lessons: 3 to 4 lessons

Purpose

This activity helps students to examine how they are interconnected to other living things. It helps students to learn about food webs and understand the interconnectedness of various elements of the environment.

Key questions

Key focus questions for this section are:

- What is a food web?
- How am I part of the food web?
- How do plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter?
- How can the food web be damaged and what will be the consequences of it?

Links with other modules

Links with the Resources from the Environment and Ourselves Modules.

Toolbox

Flip Charts

Environment and Biodiversity Flip Chart

Preparation

You will need to refer to the pages on Good and Bad Environmental Practices in the Environment and Biodiversity Flip Chart at the beginning of this section of the Module. Refer to *Teacher Information Sheet 1.1* to know more about Food Webs.

1.1 TUNING IN

The following activities help to engage and focus students' interest on the topic.

ACTIVITY 1: FOOD WEB ELEMENT ¹

Purpose: To illustrate and become familiar with food web elements.

Time: Approx. 20 minutes

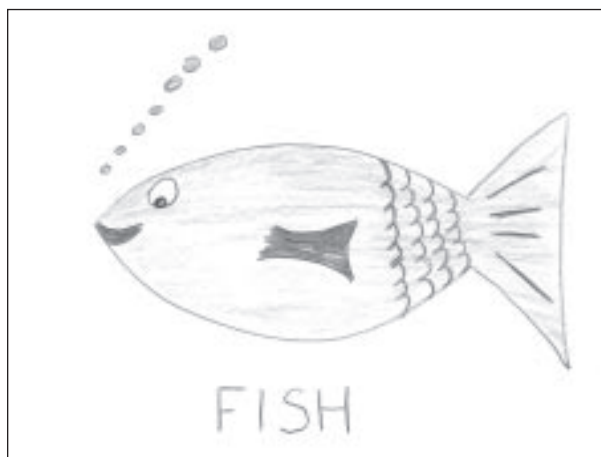
Materials Required: A4 papers or Bristle boards, markers, safety pins and sticky tape

Resource / Information Sheets: 1.1 Student Resource Sheet - Food Web Element Cards

1.2 Student Resource Sheet – Food web element cards

Procedure

Based on the list provided in *Student Resource Sheet 1.1*, make a set of cards with the names of the animal/ bird/ plant/ resource etc. The children can illustrate these cards. There should be as many cards as there are children. Cards can be made of paper cut into rectangular pieces of about 5x8cm. A safety pin or sticky tape can be used to attach the cards to the shirt of the student.



An example of an illustrated card.

1.2 DECIDING DIRECTIONS

The following activities will assist students to decide on the directions they wish to take in their research.

ACTIVITY 2: LINE OF RELATIONSHIPS ¹

Purpose: To make relationships between the elements of nature.

Time: Approx. 30 minutes

Materials Required: Illustrated cards from Activity 1 and a ball of string (about 25m long)

Resource / Information Sheets: N/A

Procedure

Ask the students to sit in a circle. Make sure to include and distribute cards depicting the four main elements of nature. Take a ball of string and give it to the 'Sun'. It is appropriate to begin with the 'Sun' because all life is made possible by it. Let the 'Sun' wind one end of the string around her finger and throw the ball to any aspect of nature she feels is related to her. For example, the 'Sun' may pass it on to 'Tree' because the 'Sun' gives energy to this element. The 'Tree' then winds the string once or twice around his finger after ensuring that it is not loose between the 'Sun' and him. He then passes it to another aspect he feels related to, e.g., 'Fruit'. So the line of relationships continues as the string unwinds and begins to form a pattern which the students hold together. The ball of string is thus completely used.



Children passing the ball of string.

¹ These 2 activities were adapted to the Maldives from the activity 'Web of Life' in Joy of Learning: Handbook of Environmental Education Activities Standards 6-8 (1996) Centre for Environment Education, India

1.3 FINDING OUT

The following activities involve students in shared experiences that provide new information about the topic and stimulate curiosity.

ACTIVITY 3: FOOD WEB

Purpose: To develop a food web and to explore the effect on the web.

Time: Approx. 45 minutes

Materials Required: Pens or pencils and student's exercise books

Resource / Information Sheets: 1.2 Student Resource sheet – Food web

Procedure

Ask the students to see the web-like effect of the string. Then ask them to raise the web to chest height. Let them hold it tightly so that if the web is pressed down it does not sag and touch the ground. Ask the students to note this.

Divide students into groups and ask students to make a food web. They could base the food web on different ecosystems (land, mangroves or sea).

Ask the students what would happen if some of these elements were destroyed, e.g., insects killed by pesticides. Let the student representing these elements drop the string. Notice the visual effect. More elements may be dropped to dramatize the effect. Now press the web down. It would probably touch the ground because it is loose.

Provide the *Student Resource Sheet 1.2* to each student.

1.4 SORTING OUT

Students at this stage will be collating, processing, analyzing and presenting the information in a variety of ways. Students will have the opportunity to further explore any questions that may have arisen when they were investigating. This would also be a good time to revisit some of the initial activities from Tuning In or Deciding Directions sections, for the students to witness how their knowledge has increased.

ACTIVITY 4: INTER-RELATIONSHIPS

Purpose: To develop an understanding of the interrelations within the elements of nature.

Time: 30 minutes

Materials Required: Pens or pencils and student's exercise books

Resource / Information Sheets: N/A

Procedure

Ask the students what would happen if the Sun or the other three major elements of nature were disturbed. Draw 4 columns on the board with the following headings (Sun, Water, Soil, Air). Write down in each column what would happen if any of these major elements were disturbed. Conclude the game by explaining to the students how inter-relationships exist and why they are important.

1.5 DRAWING CONCLUSIONS

The following activities will help students to interpret information, establish connections and confirm/reject or modify predictions.

ACTIVITY 5: INTERDEPENDENCE

Purpose: To draw conclusions on how islands support and depend on other islands within the Atoll.

Time: 30 minutes

Materials Required: Pens or pencils and student's exercise books

Resource / Information Sheets: N/A

Procedure

Discuss: think about how your island supports and is linked to the other islands in your atoll. In what ways does your island depend on other islands in the atoll? For example does your island sell fish to neighbouring islands or buy vegetables from another island? These are examples of interdependence. Think of as many examples as you can. List these on the board.

1.6 CONSIDERING, PLANNING AND TAKING ACTION

As a result of students being actively involved in decision making throughout the inquiry process, it is hoped that they will be empowered to take action which has positive personal, community and global effects. Some suggestions are listed below:



In the Maldives we rely on other islands to supply some of our needs.

ACTIVITY 6: LINE OF RELATIONSHIPS

Purpose: To develop an activity to show an understanding of the elements of nature and the relationships that exist within these elements.

Time: 30-40 minutes

Materials Required: Pens or pencils and student's exercise books

Resource / Information Sheets: N/A

Procedure

As a result of students being actively involved in decision making throughout the inquiry process, it is hoped that they will be empowered to take action which has positive personal, community effects. Some suggestions are listed below.

- Display the element labels around the room showing the linkages.
- Write a story related to your element.

1.7 EVALUATION AND REFLECTION

At this stage it may become evident that there is a need to return to some stages of the inquiry process to clarify knowledge or refine skills.

The following questions may be asked:

- Are you happy with the ways in which your information was gathered, analysed and presented?
- Is there anything you would change?
- Are there things you need to investigate further?

ACTIVITY 7: LESSONS LEARNT

Purpose: To reflect on what has been learnt and to make relationships.

Time: 30 minutes

Materials Required: Pens or pencils and student's exercise books

Resource / Information Sheets: N/A

Procedure

Ask students to write down:

- Four important ideas/concepts/information/values I have learnt in this module are ...
- Two things I now want to do for myself and for others are ...

Extension

Reflect on the use of pesticides to control certain pests that eat farmers' crops. Write a story about the food web and how pesticides can affect many living things, including ourselves.



STUDENT RESOURCE SHEET

FOOD WEB ELEMENT CARDS

Make a photocopy of the page, stick it onto a thicker piece of paper e.g., bristle board and cut out the cards.

| | | | |
|----------|-----------|-----------|---------|
| Sun | Air | Water | Soil |
| Tree | Fruit | Crow | Algae |
| Fish | Eagle | Turtle | Insect |
| Frog | Mosquito | Lizard | Leaf |
| Rat | Butterfly | Ant | Student |
| Mangrove | Dead leaf | Earthworm | Root |



STUDENT RESOURCE SHEET

FOOD WEB ELEMENT CARDS

Make a photocopy of the page, stick it onto a thicker piece of paper e.g., bristle board and cut out the cards.

| | | | |
|-------|-------------|-----------|-----------|
| Shrub | Seed | Fungus | Dragonfly |
| Whale | Spider | Snake | Dolphin |
| Tern | Fisherman | Cat | Goat |
| Tuna | Hermit Crab | Coconut | Coral |
| Bee | Crab | Dead wood | Pigeon |

1.2

STUDENT RESOURCE SHEET
FOOD CHAIN

All plants and animals need food which provides the energy they need to live.

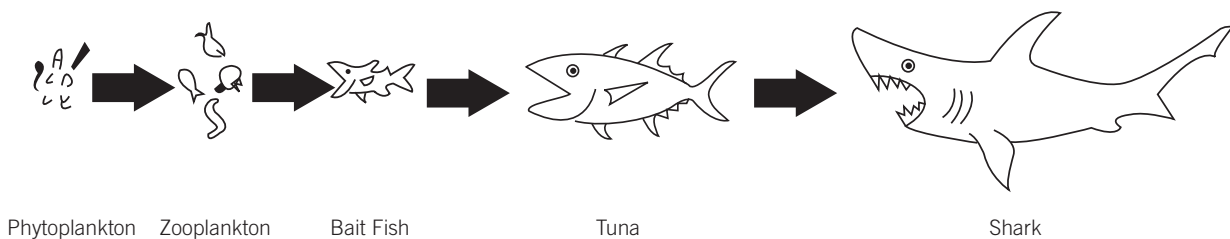
Green plants make their own food. They use the energy from the sun to make their own food. Some of this food is used, and some is stored in the roots, stems, and leaves.

Plants are called producers (they make/produce their own food by photosynthesis.)

Animals cannot make their own food. Animals get their energy and biomass by consuming (eating) other organisms.

All animals are **consumers** (they consume/eat).

What is a Food Chain?



All living things need food to give them the energy to grow and move. A food chain shows how each living thing gets its food. It shows who is eating who. The arrow means “is eaten by”.

Phytoplankton **are eaten by** Zooplankton **are eaten by** Bait Fish **are eaten by**
Tuna **are eaten by** a Shark

A food chain always starts with a green plant ...

(All plants are PRODUCERS.)

... which is eaten by an animal

(All the animals in a food chain are CONSUMERS)

A food chain ends with a predator

(The predator is at the top of the food chain)



The Sun is very important for all living things, without the sun the plants would not grow, without plants there would be no animals.

Source: <http://www.woodlands-junior.kent.sch.uk/Homework/foodchains.htm>

Illustration from A Riyaz Jauhary, A I Chamberlain (1998) 'Understanding Fisheries Science 1' Educational Development Center, Ministry of Education, Republic of Maldives

1.3

STUDENT RESOURCE SHEET

FOOD WEB

What is the difference between a food web and a food chain?

A food web consists of many food chains.

A food chain only follows just one path as animals find food. eg: Phytoplankton are eaten by Zooplankton are eaten by Bait Fish are eaten by Tuna are eaten by a Shark

A food web shows the many different paths plants and animals are connected.

e.g.: A shark might eat a tuna fish or reef fish or a small turtle.

A food web is several food chains connected together.



Other useful internet sites

What are food chains?

www.zephyrus.co.uk/foodchains

- A Child friendly site

Food Chains on Safari

www.pbs.org

Who eats what?

- Find out what various animals eat. www.kidport.com

1.1

TEACHER INFORMATION SHEET FOOD WEB

Like links in a chain, animals and plants depend upon each other for their food. Zooplankton animals feed on the phytoplankton, small fish on zoo-plankton and large fish on zoo-plankton and large fish on small fish. Some larger animals, including whales, which are mammal, eat plankton.

In a food chain the energy from the food is usually transferred to progressively larger animals, the higher the link, the larger the animal and the less chance of its being eaten by another animal. A food chain starts with plants, the primary producers, the first link. The second link in the chain is a plant-eating animal, called a herbivore. Link three is a flesh-eating animal called a carnivore, which may become food for an even larger one. Normally a food chain does not contain more than 5 links.

A simple food chain in the Maldives begins with diatoms and ends with humans. Diatoms are eaten by zoo-plankton animals, notably crustacea. Then baitfish eats zooplankton. Tuna eat Baitfish and humans eat tuna.

Some food chains involve only a few organisms. Others involve many and are complicated. Some animals called omnivores eat both plants and animals. These complicated food chains are called food webs.

Effects of pesticides on food webs

A pesticide is a chemical that is used to kill an unwanted plant or animal that is considered a 'pest' (something that is not beneficial to humans, but may play an important role in the food web). However although pesticides are used widely, they often have unwanted side effects. Over time farmers start to use more and more pesticides and these chemicals can kill many other helpful plants and insects- not just the target pest species. These pesticides can also seep into the rivers and groundwater affecting many living things, including humans and you can become sick if you eat unwashed fruits or vegetables that have pesticides on it. Some pesticides have been banned because of their serious side effects. Such pesticides were very effective at killing unwanted pests, but were also toxic to non-target organisms such as fish and wild life and this upsets the natural ecological balance. It has also been found that some pesticides 'bio-magnify' up the foodchain. That is when insects eat plants with pesticides they take up a little of the chemicals, then when a fish eats the insects they take up more pesticides, then when humans eat the fish we are eating a lot of pesticides! So when we use pesticides we can actually cause serious side effects to the environment and our health. Many scientists are now encouraging farmers to use non-chemical forms of pest control, such as from garlic or the Neem tree.

2

EXPLORING MY ATOLL

Grades: 1 to 3

Number of lessons: 3 to 4 lessons

Purpose

This activity helps students to examine where they live and how they are interconnected to other living things in the Maldives. It helps students to learn about the interconnectedness of various elements of the environment.

Key questions

Key focus questions for this module are:

- Where do I live?
- How am I connected to other islands in my atoll?
- How am I part of the food web?

Links with other Modules

Links with Resources from the Environment and Ourselves.

Toolbox

Flip Charts

Environment and Biodiversity Flip Chart

Preparation

You will need to refer to the pages on 'Traditional Knowledge Theory' on the Environment and Biodiversity Flip Chart for the beginning of this section of the Module.

2.1. TUNING IN

The following activities help to engage and focus students' interest on the topic.

ACTIVITY 1: MY ISLAND IS SPECIAL

Purpose: To learn about the facts and features of the islands in the Atoll.

Time: 30-40 minutes

Materials Required: Environment and Biodiversity Flip Chart, Invite an elder from the community (who knows about the islands in the Atoll)

Resource / Information Sheets: N/A

Procedure

Show the students the 'Traditional Knowledge' page of the Environment and Biodiversity Flip Chart. Explain that in the Maldives there is a lot of traditional knowledge about every island and every Atoll. For example about the movement of sand around the island or the best way to approach the island by boat.

Invite an elder (or teacher) from the community who knows about islands in the atoll, to give students a brief overview of features and facts about your island and different islands in the atoll. Ask the elder to relate a traditional story or special fact about your island and another island in the atoll (e.g. mangrove area, historical site or any other). If possible find an elder who could recite the 'Atholhu vehi'. Ask the students to note down how many island names they are able to recognize from the 'Atholhu vehi'.

2.2 DECIDING DIRECTIONS

The following activities will assist students to decide on the directions they wish to take in their research.

ACTIVITY 2: FINDING OUT ABOUT MY ISLAND

Purpose: To gather information about the island in which students live and to record this information.

Time: 30 minutes

Materials Required: Pens or pencils and student's exercise books

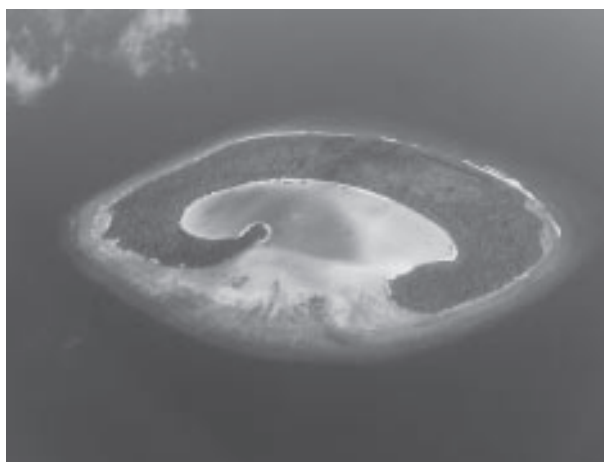
Resource / Information Sheets: 2.1 Student Resource Sheet – Information about my islands

Procedure

At home talk to your parents/grandparents/other family members about your island. Find out about:

- Size of island
- Population/No. of houses
- Economic activities/centers
- Number of Education centers
- Number of Health centers
- No. of mosques
- Numbers and types of vehicles
- Quality of well water
- Special areas (environment/historic)

Students can fill in the *Students Resource Sheet 2.1*



Every island in the Maldives is unique.

2.3 FINDING OUT

The following activities involve students in shared experiences that provide new information about the topic and stimulate curiosity.

ACTIVITY 3: FINDING OUT ABOUT MY ATOLL

Purpose: To gather information about student's Atoll and to record the information

Time: 30-40 minutes

Materials Required: Pens or pencils, student's exercise books, Internet (official website of Ministry of Atolls Development and other relevant websites) or find a resource person (to interview about the Atoll), Environment and Biodiversity Flip Chart

Resource / Information Sheets: 2.2 Student Resource Sheet- Map of the Maldives

Procedure

Show the students the Map page of the Environment and Biodiversity Flip Chart. Discuss with the students that the Maldives is made up of a double chain of Atolls. In total there are 26 natural Atolls, which have been grouped into 21 administrative regions. Ask students to find their Atoll on the map. Provide each student with *Student Resource Sheet 2.2*

Students will work in groups.

Using the Internet (Official website of Ministry of Atolls Development and other relevant websites) or contacting the Atoll Office or interviewing elders, let students find out about their Atoll and record the following:

- How many islands are in the atoll (inhabited)?
- What are the main occupations of the people in the islands/atoll?
- What are the special features of the islands / atoll?

On every island there may be many sources of information about the special features of that island and it's Atoll.

These may include:

- Elders
- Island Office
- Atoll Office
- Members of the Island Development Committee or Women's Development Committee
- Local fishermen
- School Teachers
- Dhivehi Beys Verin

In addition information may be found out from other sources, such as books, or from the internet.

Useful internet sites include:

www.atolls.gov.mv/

www.kaafuatoll.gov.mv

www.dhaalu.gov.mv

www.vaavuatoll.gov.mv

www.shaviyani.gov.mv

www.lhaviyani.gov.mv

www.noonuatoll.gov.mv

www.raa.gov.mv

www.baa.gov.mv

www.kolhumadulu.com.mv

www.gaafalif.gov.mv

www.fuvahmulah.gov.mv



Students finding out about their Atoll.

2.4 SORTING OUT

Students at this stage will be collating, processing, analyzing and presenting the information in a variety of ways. Students will have the opportunity to further explore any questions that may have arisen when they were investigating. This would also be a good time to revisit some of the initial activities from Tuning In or Deciding Directions sections, for the students to witness how their knowledge has increased.

ACTIVITY 4: SHARING KNOWLEDGE

Purpose: To collate the data gathered on the Atoll.

Time: 1 hour

Materials Required: Data from activity 3, kitchen paper, pens or pencils and markers

Resource / Information Sheets: N/A

Procedure

Summarise the data about the Atoll and show with graphs or drawings and display them around the classroom.

2.5 DRAWING CONCLUSIONS

The following activities will help students to interpret information, establish connections and confirm/reject or modify predictions.

ACTIVITY 5: INTERDEPENDENCE AND ME

Purpose: To draw conclusions about how islands are interdependent.

Time: Approx. 10-20 minutes

Materials Required: Pens or pencils and student's exercise books

Resource / Information Sheets: N/A

Procedure

Discuss: think about how your island supports and is linked to the other islands in the Atoll. In what ways does your island depend on other islands in the atoll? For example does your island sell fish to neighbouring islands or buy vegetables from another island? These are examples of interdependence. Think of as many examples as you can.



Island posters can help to promote important features of your island.

2.6 CONSIDERING, PLANNING AND TAKING ACTION

As a result of students being actively involved in decision making throughout the inquiry process, it is hoped that they will be empowered to take action which has positive personal, community and global effects.

ACTIVITY 6: MY ISLAND AND ATOLL

Purpose: To consider, plan and take action to raise awareness of your island and Atoll.

Time: Approx. 20-30 minutes

Materials Required: Pens or pencils and student' exercise books

Resource / Information Sheets: N/A

Procedure

There are many ways to raise awareness about what you have learned in this topic. Some suggestions are listed below:

- Display a map of the atoll with labels drawn by the children.
- Develop posters to inform the community about their findings.
- Write a story related to your island or atoll.
- Write a report about the atoll.

2.7 EVALUATION AND REFLECTION

At this stage it may become evident that there is a need to return to some stages of the inquiry process to clarify knowledge or refine skills.

The following questions may be asked:

- Are you happy with the ways in which your information was gathered, analysed and presented?
- Is there anything you would change?
- Are there things you need to investigate further?

ACTIVITY 7: LESSONS LEARNT

Purpose: To reflect upon what the students have learnt.

Time: Approx. 10 minutes

Materials Required: Pens or pencils and student's exercise books

Resource / Information Sheets: N/A

Procedure

Ask students to write down:

- Four important ideas/concepts/information/values I have learnt in this module are ...
- Two things I now want to do for myself and for others are ...

Extension

Reflect on other islands / atolls / country that the island community depend on? Think about trading goods / import and export, medical services, tourism and employment.



STUDENT RESOURCE SHEET

INFORMATION ABOUT MY ISLAND

Talk to your parents/grandparents/other family members to answer the following questions in the table provided.

| Question | Answer |
|--------------------------------------|--------|
| Size of island | |
| Population/No. of houses | |
| Economic activities/centers | |
| Number of Education centers | |
| Number of Health centers | |
| No. of mosques | |
| Numbers and types of vehicles | |
| Quality of well water | |
| Special areas (environment/historic) | |

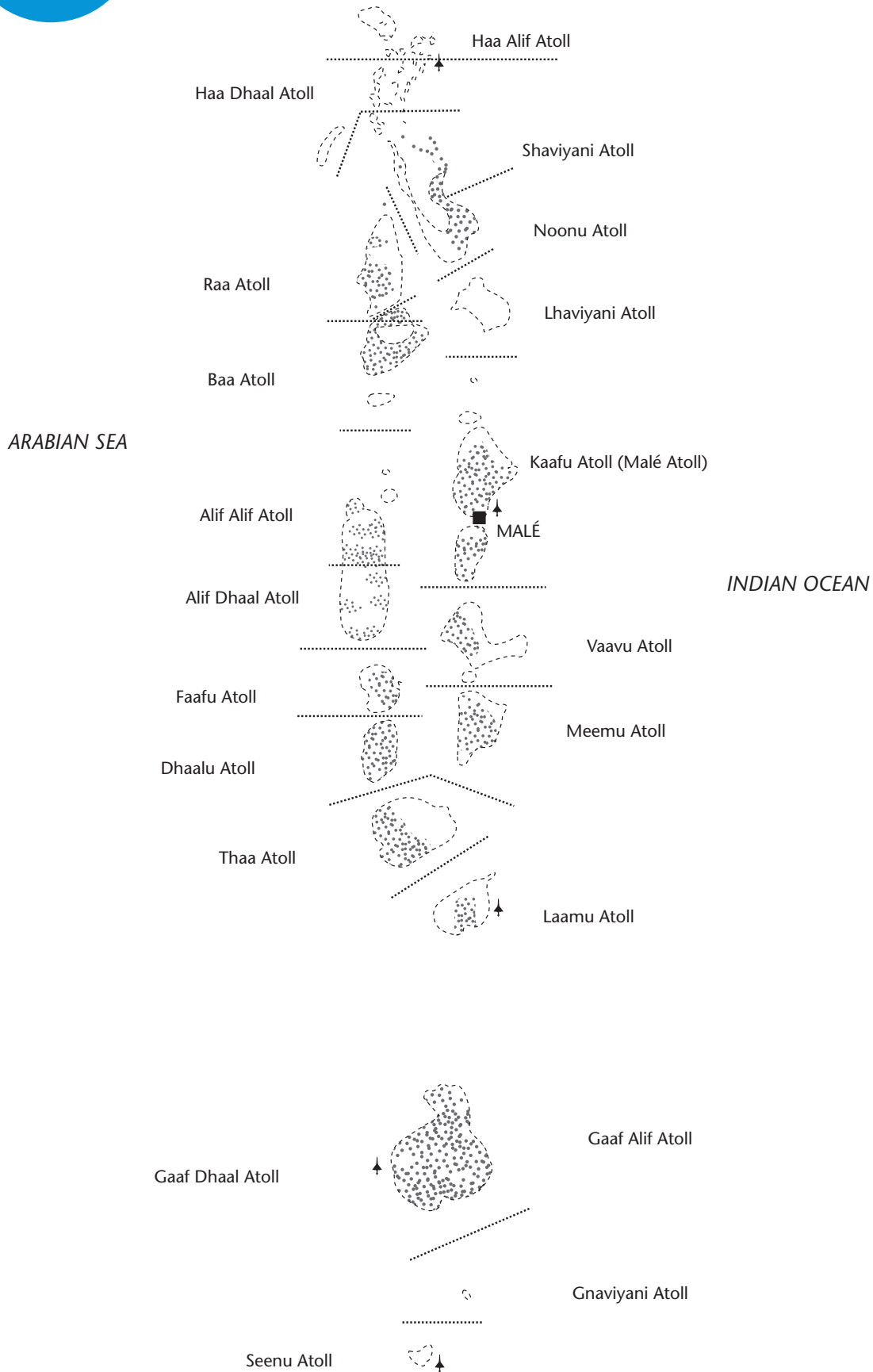
2.1

EXAMPLE OF COMPLETED STUDENT RESOURCE SHEET INFORMATION ABOUT MY ISLAND: COMPLETED FOR HAA ALIF BAARAH

| Question | Answer |
|--------------------------------------|---|
| Size of island | 248.80 hectare, length 2400m and width is 1500m |
| Population/No. of houses | 858 women 845 men = 1703 380 houses |
| Economic activities/centers | Rope making, sewing, agricultural farming, boat building, carpentry, fishing, masonry |
| Number of Education centers | 1 Government owned school up to grade 10 1 pre-school 1 Quran school |
| Number of Health centers | 1 health center with 1 doctor, 2 nurses 1 community member specializing in 'kasha Beys' (bone healing) |
| No. of mosques | 3 mosques with access to women 2 main mosques 5 small unused mosques preserved as heritage |
| Numbers and types of vehicles | 290 bicycles 1 pickup |
| Quality of well water | In the newly inhabited houses where compound is small and no parks nearby, the water has a smell. |
| Special areas (environment/historic) | Historical well 3 mangrove areas (one in the North East quadrangle and 2 in the South East quadrangle) |

2.2

STUDENT RESOURCE SHEET MAP OF THE MALDIVES



3

ECOLOGICAL FOOTPRINTS

Grades: 4 to 5

Number of lessons: 4 to 6 lessons

Purpose

The series of activities in this section helps students to see the effect of the lifestyle choices they and other people and countries make in relation to the “footprint” left on Planet Earth. It helps students to see that everything we do and every resource we use comes from the Earth and so conservation has to be an important part of everyday life.

Key questions

Key focus questions for this section are:

- What is an Ecological Footprint and why is it important?
- What is my Ecological Footprint?
- What is the effect of this?
- How can I reduce my Ecological Footprint?

Links with other Modules

Links with Earth, Resources from the Environment and Ourselves Modules

Toolbox

Flip Charts

Environment and Biodiversity Flip Chart

Preparation

You will need to refer to the page on ‘Ecological Footprint’ in the Environment and Biodiversity Flip Chart for the beginning of the module. Read *Teachers Information Sheet 3.1* in order to familiarise yourself with the concept of ecological footprints.

Cut up the slips on *Student Resource Sheet 3.2* and put them in an envelope. Make enough sets so that you have one envelope for each group of 4-6 students in your class. Put a copy of *Student Resource Sheet 3.3* in each envelope also.

3.1 TUNING IN

The following activities help to engage and focus students' interest on the topic.

ACTIVITY 1: FOOTPRINTS IN THE SAND

Purpose: To develop ideas about the concept of Ecological Footprints.

Time: 40-50 minutes

Materials Required: Pens or pencils and student's exercise books

Resource / Information Sheets: N/A

Procedure

Take students outside the classroom to the school compound or a nearby beach and ask the students to walk in a line along the sand. Ask the students to think of how many generations of ancestors might have left their footprints on the sand. Ask the students to turn around and look at the footprints they have left on the sand and explain:

- Human beings have had a great impact on the natural world – their footprints can be seen just about everywhere on the planet.
- Everywhere we go, and in everything we do, we leave an impression, an effect, like footprints on the sand. Each time we take a breath, a meal, wash, go to school, play a game, comb our hair, buy a new T-shirt – everything we do changes our physical world just a tiny little bit.
- If you could add together all the tiny changes, or footprints, we create every day then we would understand our own, individual ecological footprint.
- Ask the students to think about their island in 50 years time (in the future). Do you think your activities and actions now will leave a footprint on your island that will last into the future? (e.g. will the freshwater lens be polluted now so that it can not be used by future generations).



3.2 DECIDING DIRECTIONS

The following activities will assist students to decide on the directions they wish to take in their research.

ACTIVITY 2: OUR NEEDS & DEMANDS

Purpose: To develop an understanding of the uses of resources and the amounts of land and ocean required to support the resources.

Time: 1 hour

Materials Required: Pens or pencils and student's exercise books

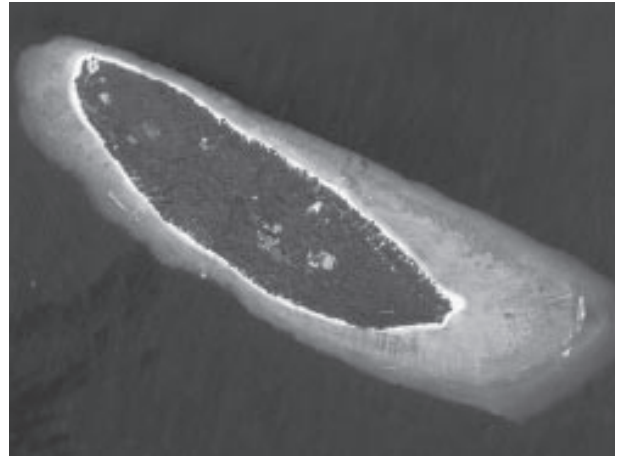
Resource / Information Sheets: N/A

Procedure

Ask students to make a list of the things they do that they think might contribute to the amount of land and ocean needed to support the resources they use – and the waste they generate. Do this by dividing students into the seven groups (as below) and ask each group to name ten things they use in the category that comes from the Earth:

- Food
- Water
- Energy
- Transport
- Clothes
- Shelter
- Entertainment

Ask students to write their lists on the board for discussion.



3.3 FINDING OUT

The following activities involve students in shared experiences that provide new information about the topic and stimulate curiosity.

ACTIVITY 3: CALCULATING YOUR ECOLOGICAL FOOTPRINT

Purpose: To calculate individual Ecological Footprints and their average footprint.

Time: 40 minutes

Materials Required: Environment and Biodiversity Flip Chart and access to internet (if available)

Resource / Information Sheets: 3.1 Student Resource sheet – How large is your footprint?

Procedure

Show students the page on ‘Ecological Footprint’ in the Environment and Biodiversity Flip Chart and explain:

In order to live, we consume what nature offers. Everything we use affects the planet’s resources. This is not a problem as long as the resources we use do not exceed what the Earth can renew. But how can we tell if we are using too much?

We use a measure called ‘Ecological Footprints’ – a measure of how much land and water area people need to produce the resources they consume and to absorb all their wastes.

Ask students to use the questionnaire in *Student Resource Sheet 3.1* to calculate their Ecological Footprint.

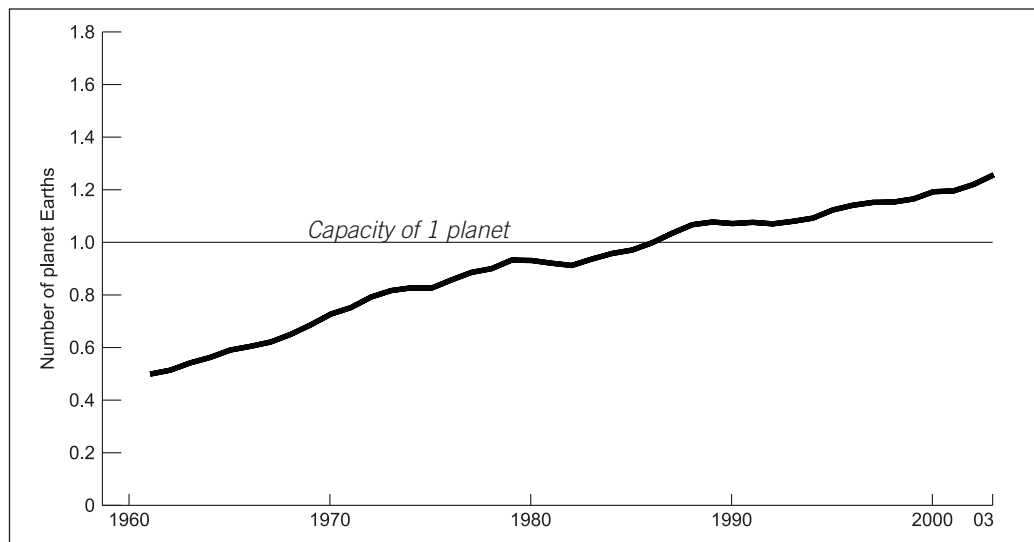
If computer access is available, students could use the on-line calculator found at:

- <http://www.powerhousemuseum.com/education/ecologic/bigfoot/low/>. This is a very interactive game based upon Ecological Footprints. Students take the role of contestants in a TV Quiz show.
- www.myfootprint.org. This multi-language calculator presents an extended form of the questionnaire and is tailored to suit the situation in different countries.

Make a frequency table on the board of the scores of all the students in the class and calculate an average.

3.4 SORTING OUT

Students at this stage will be collating, processing, analyzing and presenting the information in a variety of ways. Students will have the opportunity to further explore any questions that may have arisen when they were investigating. This would also be a good time to revisit some of the initial activities from Tuning In or Deciding Directions sections, for the students to witness how their knowledge has increased.



Humanity's Ecological Footprint, 1961–2003 © 2006 WWF (panda.org). Some rights reserved.

ACTIVITY 4: THE IMPACT OF YOUR ECOLOGICAL FOOTPRINT

Purpose: To discuss and learn more about the impact of the Ecological Footprints on the planet Earth

Time: 1 hour 20 minutes

Materials Required: Environment and Biodiversity Flip Chart

Resource / Information Sheets: 3.2 Teacher Information Sheet – World Consumption Map, 3.1 Teacher Information Sheet- Ecological Footprints

Procedure

On the board draw the following chart and explain:

If we could then add together all the other footprints for the other people living in the world, we would find that humanity's Ecological Footprint is over 23% larger than what the planet can support. In other words:

- We now need 1.23 Planet Earth's to support the lifestyle of the human race.
- In other words, it now takes more than one year and two months for the Earth to regenerate what we use in a single year.
- This is the same as spending 23% more money than you have.
- At least that is the figure for the whole world.

Show students page on 'Ecological Footprint' in the Environment and Biodiversity Flip Chart and explain:

Just as people have different sized footprints; people in different countries have different sized Ecological Footprints.

Using *Teacher Information Sheet 3.1* write up the Ecological Footprints of some other countries on the board.

Show students *Teacher Information Sheet 3.2*. This is a map of the world drawn to show the size of countries according to the size of their footprints.

Explain to students what this means in terms of rich and poor people in the world, by having a discussion on the following situation:

Imagine that you were in a school where two of the classes received a far greater share of the resources than the other eight. Imagine that the adults and children in these classes got more books, bigger dinners, smarter uniforms, better sports equipment, and longer break-times.

Imagine that they received better health care and were likely to live much longer than the other members of the school. Imagine that the affluent part of the school was tremendously wasteful and that their throw-away lifestyle was undermining the whole environment of the school. How would it feel to belong to one of those poorer classes? What would you do if you were in one of the affluent classes?

Source <http://www.wwflearning.co.uk/>

Explain to the class that if everyone in the world were to have a European- or USA-sized Footprint, then we would need several additional planets to supply the resources that would be required. In fact, if every person on Earth were to consume at the average rate of an American, Australian, Japanese or European person we would need another 3½ planets on which to grow our food and other necessities!



The size of Ecological Footprints can vary from country to country.

3.5 DRAWING CONCLUSIONS

The following activities will help students to interpret information, establish connections and confirm/reject or modify predictions.

ACTIVITY 5: CONSUMING OR CONSERVING

Purpose: To identify differences between consuming and conserving societies based on Ecological Footprints.

Time: 1 hour

Materials Required: Find the Religious Education teacher to give a talk (on conservation and for reducing waste), pens or pencils and student's exercise books

Resource / Information Sheets: 3.2 Student Resource Sheet –Cut-Up Slips
3.3 Student Resource Sheet- Comparing, Consuming and Conserving Societies

Procedure

Explain to the class that the industrial countries that have very large Ecological Footprints are “consuming societies” not “conserving societies”.

Ask the class what they think each term means.

Divide the class into small groups and give each group one of the envelopes that you have prepared with slips of paper inside (*Student Resource Sheet 3.2*). Ask the groups to read each slip of paper one by one and to decide if it refers to a “consuming society” or a “conserving society”. Tell them to place each slip in the correct column on *Student Resource Sheet 3.3*.



Do you think the Maldives is a consuming or conserving society?

Then ask the class if they think the Maldives is a “consuming society” or a “conserving society” and why?

Ask the students if they know of any religious or cultural teachings meant to encourage conservation and for reducing waste.

Ask the religious education teacher to come and give a talk to the class.

3.6 CONSIDERING, PLANNING AND TAKING ACTION

As a result of students being actively involved in decision –making throughout the inquiry process, it is hoped that they will be empowered to take action which has positive personal, community and global effects. Some suggestions are listed below:

ACTIVITY 6: ESSENTIAL AND NON-ESSENTIAL

Purpose: To categorize resources into essentials and non-essentials and to determine ways to avoid wasting essential resources.

Time: 1 hour

Materials Required: Pens or pencils and student’s exercise books

Resource / Information Sheets: 3.4 Student Resource Sheet –Daily Resource Use Timeline, 3.5 Student Resource Sheet-Making My Footprint Smaller

Procedure

Ask students to make a list of all the things they consume in a day, using the daily timeline in *Student Resource Sheet 3.4*.

Explain the meaning of the terms “essential” and “non-essential” in relation to “needs” and “wants”.

Ask students to categorise the resources they consume in a day (*from Student Resource Sheet 3.4*) into “essentials” and “non-essentials” (*Student Resource Sheet 3.5*).

In the final column of *Student Resource Sheet 3.5*, ask students to list ways that they could avoid wasting “essential” resources and use “non-essential” items less often or in smaller amounts.

3.7 EVALUATION AND REFLECTION

At this stage it may become evident that there is a need to return to some stages of the inquiry process to clarify knowledge or refine skills. The following questions may be asked:

- Are you happy with the ways in which your information was gathered, analysed and presented?
- Is there anything you would change?
- Are there things you need to investigate further?

ACTIVITY 7: LESSONS LEARNT

Purpose: To reflect upon what the students have learnt.

Time: Approx. 10 minutes

Materials Required: Pens or pencils and student’s exercise books

Resource / Information Sheets: N/A

Procedure

Ask students to write down:

- Four important ideas/concepts/information/values I have learnt in this section of the Module are ...
- Two things I now want to do for myself and for others are ...

Ask students to decide what they would like to do with the results of their research and discussion. Students could record the concepts they have developed in a poster or in an information brochure on Ecological Footprints.

3.1

STUDENT RESOURCE SHEET

HOW LARGE IS YOUR FOOTPRINT?

Ecological Footprint Quiz

Find out by answering the quiz below. Circle the number (either 1, 2 or 3) next to the answer that best fits your lifestyle.

| | | | | | |
|--|---|---|---|--|---|
| Food: | | | | | |
| 1. How much fish do you eat? | | | | | |
| Vegetarian (no fish) | 1 | Fish 1 to 4 days a week | 2 | Fish almost every day | 3 |
| 2. How much food is wasted in your household? | | | | | |
| Most is eaten | 1 | Occasional wastage as rotten or uneaten food | 2 | Uneaten food thrown away most days | 3 |
| 3. Where does your food come from? | | | | | |
| Grown at home or bought from local markets - no plastic packaging | 1 | Local produce from market packaged in plastic | 2 | Mostly imported food from market packaged in plastic | 3 |
| Travel: | | | | | |
| 4. How far does your family travel each week (on your island and between islands)? | | | | | |
| Less than 10 km per week | 1 | 10 to 30 km per week | 2 | Over 30 km per week | 3 |
| 5. Where do you go for holidays each year? | | | | | |
| Not far from home | 1 | Within my country | 2 | Fly overseas | 3 |
| 6. How do you travel to school each day? | | | | | |
| Walk/Ride | 1 | Bus/Car | 2 | Dhoni/Cycle | 3 |
| 7. Does your family have a boat? | | | | | |
| No | 1 | One with small motor | 2 | Large motor or more than one boat | 3 |
| Housing: | | | | | |
| 8. How big is your house? | | | | | |
| Small - 1 to 3 rooms | 1 | Medium - 4 to 7 rooms | 2 | Large - over 7 rooms | 3 |
| 9. What power source does your house have? | | | | | |
| Some or all solar/wind power | 1 | Only electricity | 2 | Wood/coal | 3 |

3.1

STUDENT RESOURCE SHEET HOW LARGE IS YOUR FOOTPRINT?

| | | | | | |
|--|---|---|---|---|---|
| 10. How much electricity does your household use? Check your electricity bill. | | | | | |
| Small (usage 0-100 units for 30 days) | 1 | Medium (usage 101-200 units for 30 days) | 2 | Large (usage 201-300 units for 30 days) | 3 |
| 11. How much water does your household use? | | | | | |
| Small (eg 30-50 litres per person per day) | 1 | Medium (50-100 litres per person per day) | 2 | Large (125+litres per person per day) | 3 |
| 12. How many of these waterwise activities does your family do? Turn off taps; recycle used water on garden; use rain water tank | | | | | |
| All 3 of these | 1 | 1-2 of these | 2 | None of these | 3 |
| 13. Do you reuse paper, plastic bottles and glass and make compost? | | | | | |
| All 4 of these | 1 | 2-3 of these | 2 | 0-1 of these | 3 |
| Population: | | | | | |
| 14. How many brothers and sisters do you have? | | | | | |
| None | 1 | One | 2 | Two or more | 3 |

Now add up all your circled points to find the Grand Total =

What your grand total means

Check your quiz grand total below to find out how much your particular lifestyle affects our planet.

Less than 16

You tread softly on our Earth and have a small footprint compared to others. Wish there were more of you around!

17 to 30

You have a medium footprint and your passage on Earth is damaging - the natural environment won't be able to support very many like you.

In fact, if everyone in the world lived like you, we would need two Planet Earths - not one – to meet everyone's lifestyle needs

Over 30

Lighten up! If everyone had footprints like this, we would need several more Earths to have enough resources to meet all these demands!

In fact, if everyone in the world lived like you, we would need two Planet Earths - not one – to meet everyone's lifestyle needs

Source: Share-Net, South Africa

3.2

STUDENT RESOURCE SHEET COMPARING CONSUMING AND CONSERVING SOCIETIES

Cut up the slips on this page.

| | |
|---|--|
| <p>Uses up energy and resources as if an unlimited source with no worries of their waste or renewal.</p> | <p>Uses only as much energy and resources as it needs to. Always uses renewable sources where possible and minimises waste.</p> |
| <p>Makes/buys cheap and convenient goods that don't last long.</p> | <p>Tries to make/buy long lasting goods that can be maintained and repaired.</p> |
| <p>Produces goods in large quantities. Often considers cash cost but not the effects on people (at home or abroad) and the environment.</p> | <p>Carefully considers and balances all costs - people (at home and abroad), environment and cash - involved in making goods.</p> |
| <p>Concentrates on short-term cash benefits and short-term goals.</p> | <p>Tries to show concern for the future, by looking at long - term benefits and goals - cash, people, environment.</p> |
| <p>Avoids responsibility - often relies on someone else (government) paying to develop the technology to clear up the mess.</p> | <p>Takes responsibility - individuals, communities, businesses and industry as well as government try to save energy and resources, and dispose of their wastes carefully.</p> |



STUDENT RESOURCE SHEET

COMPARING CONSUMING AND CONSERVING SOCIETIES

Paste the cut up slips under the heading that you think each cut up slip fits best under.

| Consuming Society | Conserving Society |
|-------------------|--------------------|
| | |
| | |
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3.4

STUDENT RESOURCE SHEET DAILY RESOURCE USE TIMELINE

ECOLOGICAL FOOTPRINTS

On a timeline from 5.00 am at the top to 10.00 pm at the bottom mark the hours of the day

| What I do | Resources I use |
|-------------------|-----------------|
| eg: Have a wash | Water, soap |
| eg: Eat breakfast | |
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STUDENT RESOURCE SHEET

MAKING MY FOOTPRINT SMALLER

| “Essentials” that satisfy my needs | “Non-Essentials” that satisfy my wants | What I might do to reduce my footprint |
|------------------------------------|--|--|
| eg: Fresh water for drinking | | eg: Make sure that no water is wasted |
| | eg: Plastic bag | eg: Use a woven or cloth bag when shopping |
| | | |
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3.1

TEACHER INFORMATION SHEET ECOLOGICAL FOOTPRINTS

Human beings have had a great impact on the natural world – their footprints can be seen just about everywhere on the planet. Everywhere we go, and in everything we do, we leave an impression, an effect, like footprints on the beach. Each time we take a breath, a meal, wash, go to school, play a game, comb our hair, buy a new T-shirt – everything we do changes our physical world just a tiny little bit. If you could add together all the tiny changes, or footprints, we create every day, we would understand our own, individual Ecological Footprint.

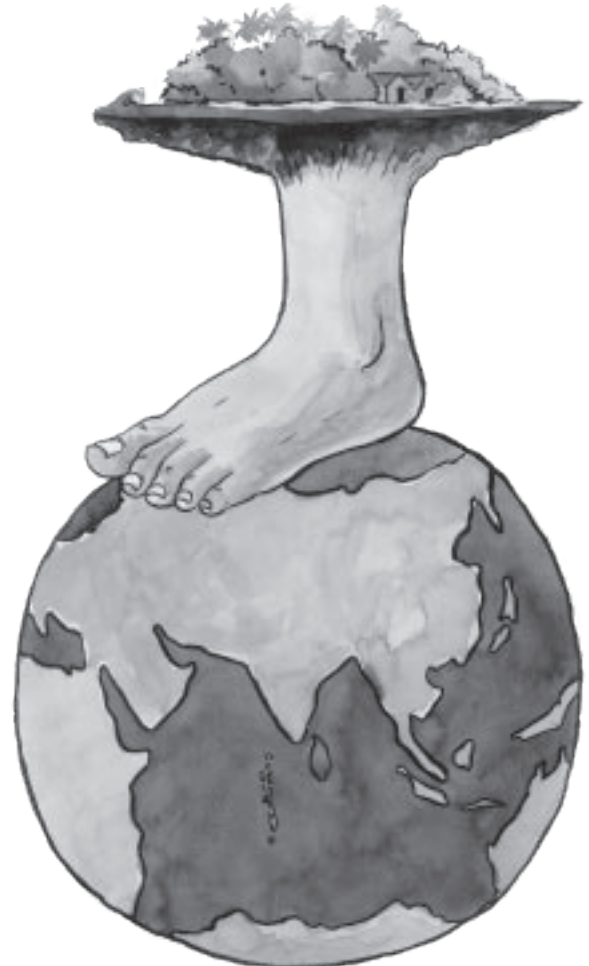
If we could then add together all the other footprints for the other people living in the world, we would find that humanity's Ecological Footprint is over 23% larger than what the planet can support. In other words:

We now need 1.23 Planet Earth's to support the lifestyle of the human race.

It now takes more than one year and two months for the Earth to regenerate what we use in a single year.

This is the same as spending 23% more money than you have.

Although populations and economies continue to grow each year, planet Earth remains the same size (WWF, 2005). Therefore we are living beyond our ecological means on Earth. Unless we make changes to the way we live, we will continue to use the natural resources on Earth and our Ecological Footprint will get bigger and bigger.



Ecological Footprints by Country

The footprint of a country is the total area required to produce the food, fibre and timber that it consumes, absorb its waste and provide space for its infrastructure. In general, Ecological Footprints decrease with a smaller population size, lower consumption per person, and higher resource efficiency. Once the footprint is calculated it is compared against biological capacity- the ability of nature to produce these resources that we depend on (WWF, 2005).

The Maldives is located within the Asia Pacific region, one of the most populous regions on the planet. In fact the Asia Pacific region includes 55% of the world's population. In 2005 the footprint of this region was 1.7 times as large as its own biological capacity. This means that, at its current rate of consumption, the region needs more than one and a half times its own land and sea space to support its resource demands (WWF, 2005). The Ecological Footprint of the

| Country | Ecological Footprint (global hectares per person) |
|------------|---|
| Bangladesh | 0.5 |
| India | 0.8 |
| Sri Lanka | 1.1 |
| Malaysia | 3.0 |
| Japan | 4.3 |
| France | 5.8 |
| Australia | 7.7 |
| USA | 9.5 |

Maldives has not been calculated; however the following table shows the respective footprints for some nearby countries.

However as can be seen from the table the average footprint of an Asian resident is still far smaller than the average footprint of people living in Europe, North America, Australia or Japan. People living in these countries have very high Ecological Footprints and will need to make major changes in order to live sustainably on Earth. Countries in Asia Pacific also need to manage ecological resources effectively. We all need to be aware of our Ecological Footprint and reduce it where possible. If we do not act promptly to reduce our Ecological Footprint, 'critical ecosystems' will be eroded beyond the point at which they can easily recover (WWF, 2005) and as time moves on we will become more and more dependent on fewer and fewer ecological resources.

Sustainable Living: Biocapacity

We cannot move to another planet once Earth is exhausted, so we must learn to live more gently now. We can all make changes to how we live in order to live more sustainably on Earth. Some suggestions from WWF (2005) include:

1. Biocapacity. We need to increase or at least maintain our ecological resources. This means protecting soil from erosion and degradation, protecting wetlands and mangroves, protecting the quality of groundwater, and maintaining healthy fisheries. It includes taking action to protect ecosystems from climate change and eliminating the use of toxic chemicals that degrade ecosystems. In the Maldives we can protect our environment by disposing of waste carefully (eg not disposing of oil/chemicals in the ocean), by reducing the amount of plastic bags we bring home and turning off the fan or air conditioner when you are no longer in the room.
2. Resource efficiency in producing goods and services. Nowadays technology allows us to produce goods and



People living in Male' would be more likely have a larger Ecological Footprint than people who live in the Atolls.



If you consume a lot of goods and services, your Ecological Footprint will be larger.

services very efficiently from a given amount of ecological resources. As a result, the average Ecological Footprint per person has stayed relatively constant. In the Maldives we can buy "Eco-friendly" products that have been produced in a more environmentally friendly way (e.g. recycled paper, phosphate free detergents).

3. Consumption of goods and services per person. The potential for reducing per person consumption depends in part on the person's income level. People living at or below subsistence may need to increase their absolute consumption levels to move out of poverty. Wealthy individuals, however, could cut their consumption of goods and services with large footprints without seriously compromising the quality of their lives. In the Maldives people have become more affluent in recent times. For example when you go to the shop you can buy a tin of biscuits in bulk, rather than in small individual plastic packets. Or instead of upgrading to a new mobile phone each year, you can buy one phone that you use for many years. By doing either of these things you reduce how much you consume each year.

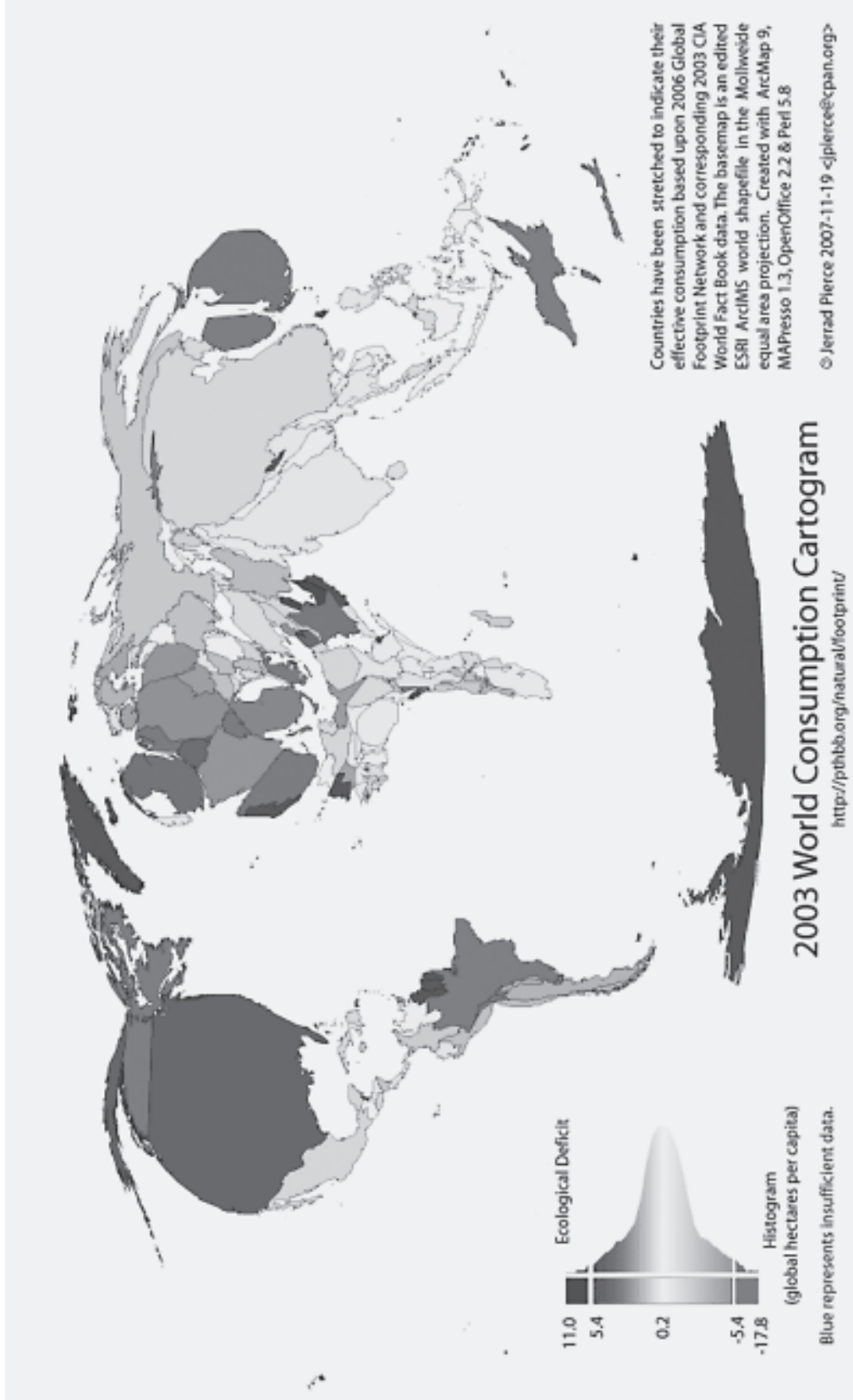
4. Size of the population. Addressing population growth will be especially critical for the Asia-Pacific region, which is already home to half the world's people. Population growth can be reduced by supporting measures that lead to families choosing to have fewer children. Offering women better education, economic opportunities and health care are three proven approaches. In the Maldives the size of the population is quite small, however as the islands in the Maldives are quite small and fragile, population densities on an island level need to be considered. People living in Male' would have a larger ecological footprint than people who live in the other atolls.

WWF(2005) "Asia-Pacific Region 2005: The Ecological Footprint and Natural Wealth", WWF, UK

3.2

TEACHER INFORMATION SHEET
WORLD CONSUMPTION MAP

Global Footprint Network 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org



GLOSSARY

Basal Energy Requirement (B.E.R.)

The amount of energy used by an organism's body just to keep alive, when no food is being digested and no muscular work is being done.

Biodiversity

The variety of life on earth

Biomass

Mass of organisms in ecosystem: the mass of living organisms within a particular environment.

Carnivore

An animal that eats other animals.

Consumer

Organism that feeds on others: in an ecological community or food chain, an organism that feeds on other organisms, or on material that has come from them. Consumers include herbivorous and carnivorous animals, which feed on plants and other animals respectively, and also organisms such as worms, fungi, and bacteria, which feed on nonliving organic material.

Decomposer

An organism such as bacteria and fungi that breaks down dead organisms and their wastes. . (They do not 'eat' the food like scavengers, as they have no mouth-parts. Instead they break down solid matter into liquids which they can absorb.) Examples: bacteria and some fungi.

Ecological Footprint

The impact or impression that each person makes on the Earth. Each person's footprint is different and is related to the way we live our lives.

Ecosystem

A community of plants, animals and micro-organisms that are linked and that interact with each other and with the physical environment.

Endangered

Threatened with extinction, as a species of plant or animal; to have put in a dangerous situation.

Environment

Everything that surrounds a living thing and affects its growth and health.

Environmental Impact Assessment

The process of identifying the potential impacts of a development, the effect of these impacts and alternatives to the development.

Environmental Impact Statement

A report that is prepared by the person or company that wants to carry out the development and is given to the environmental agency within the government.

Habitat

The area where an animal, plant or micro-organism, lives and finds the nutrients, water, sunlight, shelter and other essential needs for survival.

Herbivore

An animal that eats plants.

Omnivore

An animal that eats both plants and animals e.g. bears and humans.

Photosynthesis

The process by which green plants or algae use sunlight to produce carbohydrates (starch). Oxygen is released as a by-product of photosynthesis.

Predators

Kill for food. They are either secondary or tertiary consumers - e.g. polar bears, golden eagles

Prey

Are the organisms that predators feed on. Examples of predator and prey species are: fox and rabbit; blue tit and caterpillar; wolf and lamb

Primary Consumer

Animals that consume only plant matter. They are herbivores - e.g. rabbits, caterpillars, cows, sheep, and deer.

Producer

Usually a green plant that produces its own food by photosynthesis

Reclamation

To fill an area with soil or debris to gain space.

Scavenger

A consumer that eats dead animals (e.g. crab, crow and vulture)

GLOSSARY

Secondary Consumer

Animals that eat primary consumers (herbivores).

Sediment

Material which settles out of a liquid to form a layer.

Sewage

Fluid containing water borne, domestic and human waste.

Species

A group of organisms that has a unique set of characteristics that distinguishes them from other organisms.

Sustainability

Meeting the needs of the present without diminishing the ability of people, other species or future generations to survive.

Tertiary Consumer

Animals that eat secondary consumers i.e. carnivores that feed on other carnivores.

Traditional Knowledge

Local knowledge that has been gained over many years after close contact with the environment.

Trophic Level

A trophic level is each level in a food chain. Matter is always 'lost' as heat energy at each trophic level.

All kids are gifted,
some just open their packages earlier