The Environment and Us

This module provides an introduction to the study of the earth's environment, and some of the challenges facing people and the planet today.

The module has the following features:

- A **student's book** containing eight chapters of information, exercises and activities looking at different aspects of the environment.
- A detailed **teacher's book** with instructions and answers to all activities and exercises in the module. Different options are provided for some of the activities in order to suit the level of the students and the time and resources available. Suggestions are also made for optional extra activities.
- **Extra material**:
  - Additional readings for classes wanting to explore specific examples of environmental issues from around the world
  - An optional unit based on An Inconvenient Truth, a documentary about global warming. Copies of the DVD are available on request

Language

It is very hard to explain some ideas in simple English. The language in this module is mostly at a high pre-intermediate or low intermediate level, but it also introduces quite a lot of environmental terminology. You may need to translate some of the texts, ideas and exercises into the students' language. A Myanmar translation of this module is also available.

Additional Information

If you or your students want further information on any of the topics in this module, we can provide a DVD of the **Encarta** encylopedia on request.

There are also many useful websites you can visit if you have access to the internet. Some focus on international issues, some on local issues, and some are general. Useful general sites include:

http://www.wikipedia.org/ – an online encyclopedia

http://simple.wikipedia.org/ – a version of Wikipedia in easier English which doesn't have so many articles

http://encarta.msn.com/ – a limited version of the Encarta encyclopedia which doesn't require a disk.

Key points

By the end of each chapter, students should be familiar with issues in the following areas:

1. Introduction

- What makes up 'the environment'
- Natural, built and social/cultural environments

2. Waste

- Reasons for waste
- Household and industrial waste
- Plastic and Persistent Organic Pollutants
- The five Rs

3. Ecosystems, biodiversity and resources

- What is an ecosystem?
- Food webs
- Biodiversity
- Natural resources
- Renewable and non-renewable resources

4. Water

- The water cycle
- Freshwater systems: rivers, streams and tributaries
- Groundwater
- Water use, water shortages and privatisation
- Oceans
- Fish and fishing
- Connections between land pollution and sea pollution.

5. Forests

- Types of forests
- Rainforests
- Uses of forests for people and ecosystems
- Connections between human communities and forests
- Deforestation

6. Energy

- What is energy?
- The carbon cycle
- Differences in energy use between countries
- Oil and natural gas
- Hydroelectric dams
- Firewood

7. Climate change

- The greenhouse effect
- Natural and human-made climate change
- The effects of climate change
- Adaptation and mitigation
- Into the future

8. Development, people and the environment

- Top-down and bottom-up development
- Development issues for rural communities and the environment
- Development alternatives
- Natural resource management

1. Introduction

Brainstorm:

Make a class list of things that are part of the classroom environment.
Write them on the board.
Encourage students to think of as many as possible, not only things they can see or things in nature.

e.g. *chairs, tables, blackboards, lights, pens, pencils, books, students, a teacher, plastic, air, soil, bamboo, water, language, religion, knowledge, ideas and words.*

Students read the text. Clarify anything they don't understand.

Activity:

Students look at the pictures and list things that are in the natural environment.
Get students to compare their answers in pairs.
Make a class list on the board.

Possible answers: *air, soil, mountains, river, waterfall, trees, plants, birds, a snake, a person, a buffalo, a deer, rocks.*

Repeat this for built environment.

Possible answers: *a car, houses, a temple, a sign, a road, a railway*

Elicit suggestions about what is part of the social and cultural environment.

Possible answers: *Buddhism (temple), farming (buffalo), community (houses)*

Exercise:

Students put the words into different categories.
There is more than one right answer, e.g. *A village head is a person - natural environment. Their job is social and cultural environment.*

Possible answers:

Natural environment: *a tree, a coconut, rain, the Bay of Bengal, planet earth, a caterpillar, a water buffalo, soil, a shark, gold*
Built environment: *Pa'an, a television, Shwedagon Pagoda, a pencil, electricity*
Social and cultural environment: *Buddhism, Kachin State, Mon language, a village head*

Discussion:

Do this as a **Pyramid discussion.**
Ask students to rank the three types of environment: physical, built and social and cultural.
They should put a *1* next to the most important and a *3* next to the least important.
In pairs, students discuss their ranking until they agree.
Pairs join together to make groups of four, and agree on a ranking.
Groups join to make groups of 8, and agree on a ranking.
Have a class discussion.
Encourage everyone to reach an agreement.

As a class, discuss:
Can we survive without any of these environments?
What do we need to survive?

Activity:

Students work in pairs.
Encourage discussion about how things are related.
There are many possible answers.
Make the point that many different things in the environment are connected.
e.g. *a pencil comes from a tree*

Discussion:

Discuss in small groups and write answers on the board.

For Mon language, try and elicit the idea that languages have a lot of information vital for the culture to survive. When languages disappear, a lot of local knowledge also disappears.

Think about what frogs eat. Then talk about what animals eat frogs, e.g. Frogs eat a lot of mosquitoes so there would be many more mosquitoes around if there weren't any frogs.

2. Waste

Activity:

Students list all the waste they made in the past week - all the things they have thrown away.
Possible answers: *30 plastic bags, 2 noodle packets, 3 plastic drink bottles, 1 newspaper, 1 old t-shirt, the peel of 7 oranges, 5 small pork bones, 5 egg shells, etc.*

Students decide what is necessary. If they need something for their survival, it is necessary, e.g. basic food, water, clothes, shelter. If they can easily live without something, it is unnecessary, e.g. a packet of biscuits, a bottle of cola.

Put a line through unnecessary waste.
Possible answers: ~~*10 plastic bags*~~ (they can use a cloth bag or a basket), *2 noodle packets* (if students have no other food, then necessary), *1 old t-shirt* (it is necessary to wear clothes)
In groups of four, students compare the amount of waste they have made in the past week.
Get them to decide who made the most waste.
Bring the class together. Discuss why some people make more waste than others.
e.g. *Ma Ma Aye buys a lot of cake wrapped in plastic.*
Khaing Aung spends a lot of time in the jungle so his clothes get damaged quickly.

Discussion:

Students discuss the questions in groups of three or four.
Make sure they think of reasons to support their argument.

Possible answer:

Waste is decreasing because people are very poor, they don't have money. Waste from plastic packaging is increasing because there are many cheap things from factories in shops now.

Students think about the three paragraphs in the context of their community.

Possible answers:

There are more/fewer people in our community, so there is more/less waste.
People are not consuming more because they have no money or
People are consuming more because there are many cheap things available, like MaMa Noodles.
A lot of the waste in our community is home-cooked food, so it decomposes easily.
People in our community are eating more packaged food and buying food in polystyrene containers, which do not decompose easily.

Types of waste

Exercise:

Students work alone and write the answers in their book.

Possible answer:

Industrial waste has metals.
Industrial waste is more dangerous because there are a lot of toxic chemicals.
Industrial waste has bigger things like machines.
A lot of household waste (food scraps, wood, leaves, etc.) is natural.

Discussion:

Students discuss in small groups, and then have a class discussion.

a) Encourage students to think about issues with burning waste and burying waste.
Burning waste, especially plastic, causes very bad air pollution.
It is better to bury waste in one place instead of burning it.
b) Students think of a list of problems.

Possible answers:

Plastic lasts a long time. It is not easy to get rid of it.
A lot of plastic gets thrown onto the ground.
This is bad for animals because they can get caught in plastic.
Plastic often goes into streams. Fish can get caught.

Plastic and POPs

Exercise:

Students talk about the picture in pairs and write the answers in their book.

Possible answers:

A person sprays pesticides containing POPs on a plant.
A caterpillar eats the plant. The chemicals go into its body.
It turns into a butterfly.
A fish eats the butterfly and the POPs are passed on into its body.
The fish gets eaten by a bigger fish and the POPs get passed on.
The bigger fish becomes food for people and is poisonous.

Brainstorm:

Students brainstorm in groups of three or four. Which group has the most ideas?

a) Groups list all the things they can think of that are made of plastic.

Possible answers: *Bags, boxes, bottles, computers, shoes, folders, etc...*

b) Encourage students to think about things people used in their community before plastic.

Possible answers: *Banana leaves, straw baskets, a longyi, a cloth bag, newspaper, cardboard boxes, bamboo, etc.*

Making less waste: the five Rs

Activity:

Students work in small groups to make a poster.
If you like, get groups to present their posters to the class.

Case study: Rubbish Recycling Programme

Activity:

Students guess what the pictures are of and what the things are made from. Write their ideas on the board.

Activity:

Students match the explanations with the pictures on page 6.

Answers;

a) *3*
b) *4*
c) *2*
d) *1*
e) *3*
f) *5*
g) *6*

Discussion:

Students decide how the programme benefits the environment and the community.

Possible answer:

The programme helps get rid of rubbish. This means there is less pollution. It educates people about waste so they will use less. It makes useful things out of waste that the community can use. These are very cheap, or free.

Extra activity

1. Divide the class into small groups.
2. Give each group an item from the programme, e.g. rope, lettering, windows.
3. Each group has to try to sell their product to the class. Students spend some time discussing how they will convince the class to buy their product.
5. Students take it in turns to persuade the class.
6. The class decides which group is the most convincing.

Activity:

In groups, pairs or individually, students do this for homework. The class can vote for the best item.

Review:

Possible answers:

1. *Waste is anything people don't want and throw away.*
2. *Two main types of waste are household and industrial. Household waste is from people's homes, like newspapers, food scraps and old clothes. Industrial waste is from industry, like chemicals, metals and plastics.*
3. *There are many environmental problems with waste. Waste can cause a lot of pollution. A lot of waste goes into rivers and the sea causing water pollution. Some waste is very dangerous such as POPs and toxic chemicals. These cause health problems for people. Some waste like plastic takes a very long time to break down.*
4. *A good solution is to consume less. By following the five Rs, we can reduce the waste in our community. Instead of using plastic, we can use natural things like banana leaves.*
5. *POP stands for Persistent Organic Pollutant. They are in some plastics and pesticides and fertilisers. They don't break down. They move up the food chain and can travel a long way. POPs are dangerous to people. They can cause cancer and stop people from being able to have babies.*

3. Ecosystems, biodiversity and resources

What is an ecosytem?

Students read the text. Clarify anything they don’t understand.

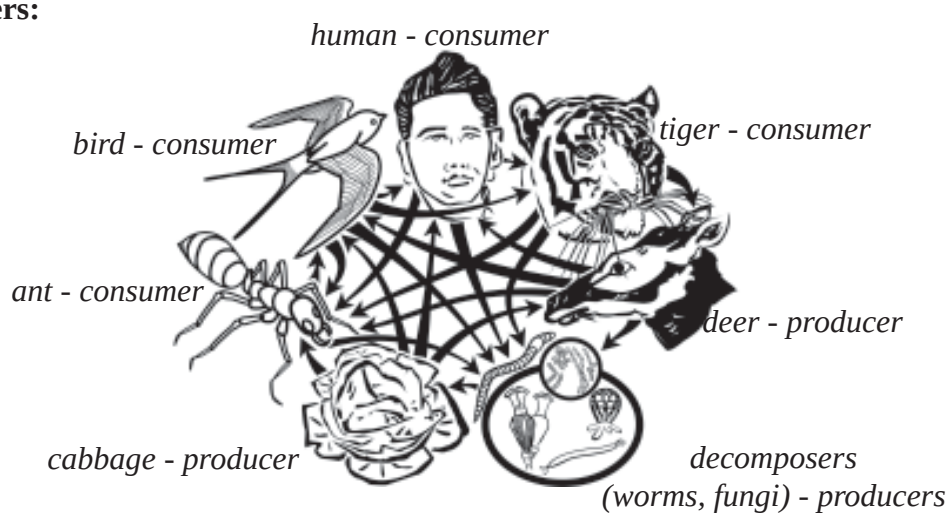
Food webs

Students read the text. Clarify anything they don’t understand.

Activity:

Students label the different living things in the food web.

Answers:



They then make sentences about what is going on in the food web, e.g.
The tiger eats the deer. The fungi decomposes the bird, after the bird dies.

Activity:

In small groups, students talk about caterpillars. What do they eat? What eats them? Groups draw a food web about caterpillars.

Groups discuss what would happen if caterpillars disappeared. Encourage them to think about the role caterpillars have in the food web. What happens to the food web if caterpillars are taken out? Write the answers on the board.

Activity:

If possible, send students to look around your area. They should try to find at least one example of a plant, plant-eater, animal-eater and decomposer, then make a food web. Discuss whether they think some members of the web are more important than others.

Extra activity

1. Divide the class into groups of 6, standing facing each other in a circle.
2. Give each student a card with the name of a living thing. You can find cards on page 45 of this Teacher's Book - copy and cut one out for each student.
3. Tell the students that they are going to make a food web. Give each group a ball of string. The person who is a mango tree takes the string.
4. They then pass it to the person who eats bamboo. The string keeps being passed onto people until they have a complex food web.
5. Students take it in turns to drop the string. The group talk about what effect it has on the food web. The student picks up the string and another student drops it. What does this say about interdependence?

Mindmap:

Students work in small groups to draw mindmaps.

Examples of ecosystems for mindmap: *plains, mountains, rivers, streams, the sea, hills.*

Biodiversity

Guess:

Students guess how many species there are. Write their guesses on the board.
There are approximately 30 - 100 million species on earth. Nobody knows the exact number because many species have not been written down by scientists. Also, people don't know how many species are disappearing.

Check the meaning

Students decide which sentence is closest to the correct meaning.

Answer:

a) There are a lot of different species in rainforests and coral reefs.

Check the meaning

Students decide which sentence is closest to the correct meaning.

Answer:

b) We do not know all the species that are being lost, what effect this will have on the earth and what scientific information the species can give us.

> **Note:** Trade in **endangered species** is also a big threat to biodiversity. Many tigers are caught and killed in Myanmar. They get sold to China and Thailand for medicine. Some tigers are also caught and sold as pets or the skin is sold to decorate people's houses.
>
> **endangered species** (n) – species of plant or animal that could soon disappear because of habitat loss, pollution, hunting, etc.

Exercise:

Students write the answers. Discuss the answers as a class.

Possible answers:

a) *Biodiversity is important because our community is interdependent with species in the area. We need different animals and plants for food. Eating many different things is more healthy than only eating rice and fishpaste. Living things are interdependent with each other so we need to protect biodiversity to protect all living things in our area, including ourselves.*

b) *Habitat loss, hunting, illegal wildlife trade, pollution.*

c) *Educate people about the environment. Get the community to limit the types and numbers of animals that can be hunted. Protect different habitats like forests, rivers and plains.*

Natural Resources

Brainstorm:

Students write their answers in their book.
They then discuss their answers in small groups.

Review:

Students write the answers.

Possible answers:

1. *Interdependence means things need each other to survive. An ecosystem is a way of understanding how living and non-living things are interdependent in environments. Biodiversity is the number and different types of species.*
2. *The forest around Bhamo is an ecosystem. Trees, soil, plants, animals, insects and minerals are important parts of the ecosystem.*
3. *Protect different habitats around the community by not killing too many of one species and not cutting down trees that take hundreds of years to grow again.*
4. *Renewable resources grow back naturally. Non-renewable resources don't grow back or they take a very long time to grow back.*
5. *Wood, rubber, gems, gold, soil, water, rocks, clay, vines, etc.*

4. Water

If you like, you can start this section with the optional quiz below.

Extra activity: Water Quiz

1. Organise students into teams of four or five.
2. Ask questions. You can make extra questions if you like.
3. Teams discuss the correct answer. The first team to stand up and answer the question correctly gets one point.

Questions (and answers):

1. What is the world's largest ocean? *Pacific Ocean, 166,242,500 sq km.*
2. What is the world's longest river? *The Nile, 6695 km.*
3. What is Asia's longest river? *The Yangtze, China, 6378 km.*
4. What is the Asia's largest lake? *Lake Baikal, Russia, 31,500 sq km (also the world's deepest).*
5. What is the world's largest dam? *Three Gorges Dam, China. It is costing China more than US$75,000,000,000 and up to 1,900,000 people have had to leave their homes.*
6. What are the world's five oceans? *Pacific, Indian, Atlantic, Arctic and Antarctic.*
7. What is the world's highest waterfall? *Angel Falls, Venezuela, 978 m.*
8. What is the largest animal living on Earth? *The blue whale.*

Discussion:

Students discuss in small groups, then as a class.

a) Possible answer:

Water is the most important resource because all living things need it to survive or *Water is not the most important resource because it is not valuable/people need food to survive/ many things are important, etc.*

b) Possible answers:

Drinking, cooking, washing, growing plants, playing, etc.

c) Possible answers:

If you don't have enough water, you will die.

Brainstorm:

Students research this in pairs. If available, use maps.

Possible answers:

Ayeyarwady River, Thanlwin River, Chindwin River, Mekong River, Inle Lake.

Water Facts: True or False?

Students answer the questions in pairs. Write the answers on the board.

Answers:

Water covers more than... ***a)*** *2/3 of the Earth's surface.*
Out of all of the Earth's water... ***b)*** *97.5% is saltwater.*
How much of the world's freshwater is kept in rivers, lakes and wetlands? ***a)*** *0.01%*
The rest of the world's freshwater is kept... ***b)*** *in ice, snow and underground.*

The water cycle

Students read the text. Clarify anything they don't understand.

Freshwater systems

Note: Catchments include everything living within them and everything built on them. In this way, people are often part of catchments. Looking after catchment ecosystems is a very important part of looking after rivers. Like all ecosystems, catchments are sensitive to changes. People can live and support catchments or they can destroy them. Many communities are connected to each other through rivers and catchments.

Research:

Myanmar's international rivers: *The Ayeyarwady, the Chindwin, the Mekong and the Thanlwin.* The Moei is also international but it is only a tributary of the Thanlwin.

Put students into groups of four or five. Encourage students to look at different maps and atlases if available. Get them to choose a river. They should draw one map showing the path of the river, the countries it flows through and types of environments, e.g. draw mountains to show it goes through an area with a lot of mountains.
They should be as accurate as possible but it is OK if they only draw a very rough map.

Activity:

a) Students work in pairs or groups of three.
Encourage students to research by talking to people in their community who fish.
See which group finds the most species.

b) Students write answers, then discuss as a class. Write ideas on the board.

Possible answers:

Rivers, lakes, streams and wetlands need to be protected.
People should not cut down trees in catchments.
Limit the number of fish that can be taken.
Stop people from killing endangered species.

Note: The many streams that collect water and flow into it rivers are called **tributaries.** The Moei River is an important tributary of the Thanlwin River. Catchments drain water into rivers in many places along the way. Eventually rivers flow into the sea or large lakes. Before rivers flow into the sea, their waters mix with saltwater. This area is called an **estuary**. It is rich in biodiversity and supports many species of fish.

tributary (n) – a river or stream that flows into a larger river
estuary (n) – part of river near the sea where saltwater and freshwater mix together. *There are many species of fish in estuaries.*

Groundwater

Discussion:

Students discuss in small groups, then talk about ideas with the whole class.

Possible answer: *Freshwater comes from a stream. It is used sustainably because catchments are protected and not too much water is taken* or *It is not used sustainably because too much water is taken during the dry season. There is not enough water for people and the water is too low for a lot of fish.*

Additional reading 1: 'The largest poisoning in history', page 41.

This is about arsenic in groundwater in Bangladesh. Encourage students to read the text and answer the questions for more information.

Exercise:

Students answer the question, using any language they like.
As a class, discuss what they think the most serious problem is.

Note: Many wetlands are fully supported by groundwater. They are in places where groundwater is slowly flowing up to the earth's surface every day. Groundwater also helps stop flooding. During the rainy season, there is often too much water for river systems. Aquifers take some of this water. Now, water is being taken out of aquifers at a much faster speed that they can be renewed. This can cause them to shrink. This happens because the sand and small rocks in the water become hard. When an aquifer shrinks, it never gets bigger again. So all around the world, we are losing huge amounts of water because of shrinking aquifers. This loss is around 200 billion cubic metres every year.

Water Crisis

Exercise:

Students write the answers in their book, then discuss with a partner.

1. Possible answer:

The graph shows that for most countries, the majority of water is used for agriculture and little for industry. This is because agriculture is very important for the economies of poor countries. For rich countries like the USA, the majority of water is used for industry.

2. Possible answer:

The main differences is that the majority of water in Myanmar gets used in agriculture and the majority of water in the USA gets used in industry. Myanmar is closer to the world average.

3. Possible answer:

This is because the majority of countries in the world rely on agriculture. For the USA, industry is very important for the economy.

Discussion:

Students discuss in small groups, and then as a class.

1. Possible answer:

Potatoes, rice, beans, wheat, etc.

2. and 3. Students discuss how water resources are managed.

Who decides how water is used? Does everyone in the community have a say? Is it equal?

4. Possible answer:

War, inequalities in society, water privatisation, water shortages, etc.

5. Encourage students to give their own opinions.

Possible answer:

Some people have no opportunity to participate in decision-making about water access. Often, the powerful people in a society or community control the water resources. Sometimes they make decisions without thinking about the needs of all community members.

Activity:

Students work in groups of four or five. Encourage them to go and talk to older people in the community about stories they remember. They write down the story as a book or on a poster.

Encourage them to draw pictures for it. If the stories are different, students can present them to the class. The stories should involve water in a significant way.

If you like, get students to make their story into a play and perform it in front of the class.

Oceans

Brainstorm:

Students write ocean related-words in their books, then make a class list on the board.

Encourage some students to present their descriptions of the ocean to the class.

Discussion:

Discuss as a class and write students' ideas on the board.

1. Possible answer:

Our community is connected to the ocean through rivers, streams and tributaries. The streams and rivers in our community are supported by the ocean through the water cycle. Water goes into the air from the ocean. It then comes down as rain flowing into rivers.

2. Possible answer:

Our community benefits from the ocean through the water cycle. The ocean supports the rivers that give us freshwater.

3. Possible answer:

Coral reefs are important for maintaining biodiversity in the world.
Species living on coral reefs can be used as medicine.
Coral reefs are important for cultures of people who live near them. To keep cultural diversity in Myanmar, we need to keep coral reefs for the people who use them.

Fish and fishing

In your own words:

Students write the answers, then check them as a class.

Possible answer:

Trawlers take huge amounts of fish. This sometimes means there isn't enough for small-scale fishers. They take all fish that get caught in the net. This can mean endangered species or animals like sea turtles and dolphins. Some trawlers rip up everything on the bottom of the sea. They destroy coral reefs and many sea plants.

Discussion:

Discuss in small groups and then as a class.

Possible answer:

One problem for small fishers is not having enough fish. If that is their job, they need to find fish for their family. If there isn't any fish, there will be big problems for their family and community.

Additional reading 2: 'Fishing rights in Myanmar waters', page 42.

Encourage students to read the text and answer the questions for more information about fishing issues. If you like, do the discussion questions in class.

Land pollution = Sea pollution

Exercises:

Students write their answers.

1. Possible answers:

Waste from the village, petrol from a boat engine, pesticides and fertilisers from a farmer, oil from a tanker and waste from a factory.

2. Possible answer:

Our community is connected to the sea through rivers, streams and catchments. If we pollute the river or land, we are polluting the sea.

5. Forests

Discussion:

Students write their answers, then discuss them as a class.

1. Possible answer:

Area of land with many trees and other plants.

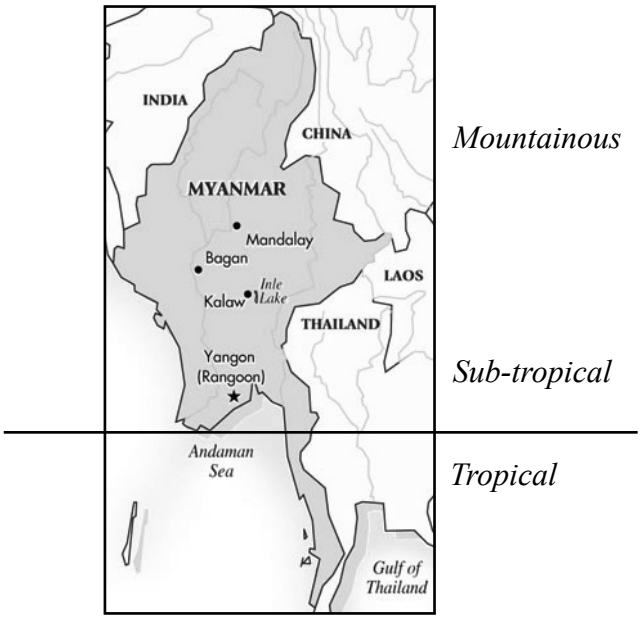
2. Possible answer:

They are important for biodiversity because there are many plant and animal species in forests. They provide food, shelter, medicine, building materials and firewood.

Activity:

Students work in small groups. Use maps or atlases if available.

Possible answer:



Rainforests

Brainstorm:

Students brainstorm in small groups.

1. Have a competition to see which group can think of the most rainforest species in five minutes.

Possible answers:

Fungus, mushroom, tree fern, orchid, tiger, hawk, anteater, caterpillar, woody vine, crow, python, wolf, deer, vulture, elephant, grass, fig tree etc.

2. Discuss the question with the class. Write ideas on the board.

Possible answers:

The most important species are decomposers and producers. Decomposers (fungi,worms, mushrooms) are important because they recycle the energy from dead species so the nutrients an be used again. Producers (fig tree, grass, tree fern, orchid) are very important because they are the main support species for all the consumers (deer, tiger, hawk, wolf). They produce the energy that supports the food chain.

Uses of forests

Exercise:

Students write the answers, then check them with the person next to them.

Answers:

Weather - Forests play an important role in global climate. They keep a lot of carbon within the forest. When a forest is destroyed, the carbon goes into the air and adds to global warming.

Water - Forests are a key part of the water cycle. A lot of water goes into the sky from trees. Forests are important parts of catchments. They keep water and release it slowly into streams and rivers.

Soil - Forests protect soil from **erosion**. Trees shelter the soil from wind and rain.

Control of floods - The way forests and the soil take water helps stop flooding. When forests are destroyed, rainwater often floods villages and other land in the area.

Biodiversity - Forests are a habitat for more than half of the world's species. They are the richest habitats on earth.

Communities - Forests provide food, shelter, medicine, firewood, hardwood for building houses and materials for making clothes, baskets and other useful things.

Discussion:

Divide the class into groups and discuss. Compare ideas - which group has the most ideas?

1. Possible answer:

Our community benefits from the forest in many ways. The forest gives us a lot of food, medicine and wood to build houses. We get firewood from the forest for cooking and heat. Forests also help stop flooding because they keep water.

2. Possible answer:

Water leaf, roselle, bamboo, banana flower, squirrel, snail, honey, wild pig.

Forests and communities

In your own words:

Students write their answers.

Possible answer:

Trees are one of the main parts of rainforest ecosystems. They take sun and water and give nutrients and energy to many species. Smaller plants are also very important because they support many insects and small animals. Together they form the base of rainforest ecosystems. Decomposers complete the cycle. They take dead plants and animals and recycle them so they can be used again.

Group work:

Students work in groups of four or five.
Encourage them to talk to different people in their community to find a story.
They should try and draw or find pictures to go with the story.
Get them to present their poster to the class.
Students should be able to explain how the story relates to forests and what message it has.

Activity:

Students should try and find out how forests are managed in their communities or a community they know. Encourage them to talk to village elders if possible. If this is not relevant to your students' situation, you can skip this activity.

Deforestation

Activity:

Students work in pairs and draw the graph using the figures.

Brainstorm:

Students write answers, than compare with the person next to them.

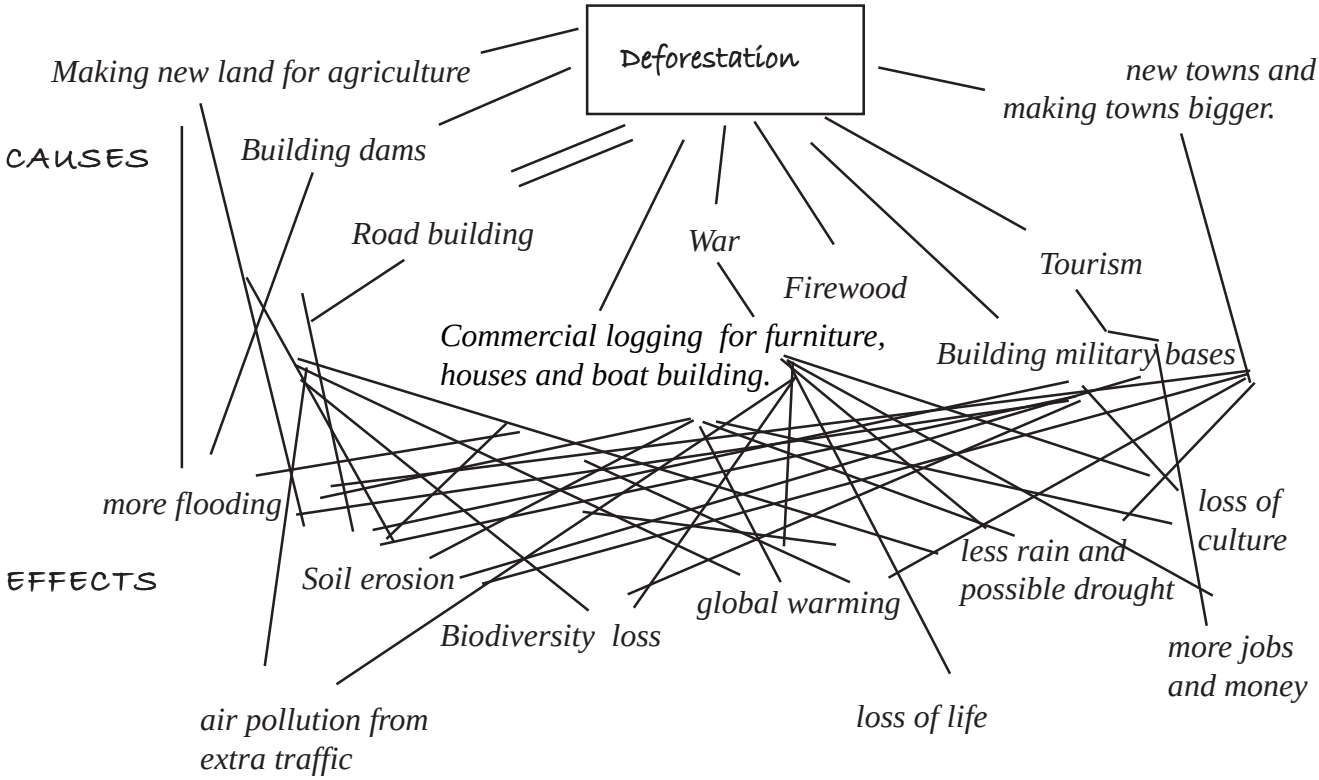
Possible answers:

Teak is very popular because it looks beautiful and very strong. Furniture, houses, boats, fences and doors are made from teak.

Activity:

Students complete the chart. They can work in pairs if it is too difficult.
They should write down as many ideas as they can.
Get them to write as many ideas as they can. Use large sheets of paper if available.

Possible answer:



Case study: Community Forest Groups

Exercise:

Students write their answers.

Possible answers:

They are supporting the forest by doing reforestation. This helps fix some of the damage that has been done. It is also good for community education. Villagers have to learn a lot about forests and how forests ecosystems work when they are involved in reforestation projects.

Discussion:

Students discuss ideas in small groups. Get them to think about the chart above and list solutions to some of the causes.

Possible answers:

Have agreements for protecting forests
Limit deforestation
Have village participation so everyone is involved in decisions about forestry management
Educate people about forest conservation

6. Energy

Brainstorm:

In pairs, students write the answers. Write some of the ideas on the board.

Possible answers:

Cooking, making tea, using light from a candle, karaoke, watching TV etc...
The main things our community uses energy for are cooking, boiling water for tea, light, listening to the radio, etc.

Exercises:

Students write the answers, then check with class.

1. Possible answer:

They take thousands of years to form. They cannot be used again.
Fossil fuels are used much faster than they replace.

2. Possible answer:

Burning fossil fuels creates a lot of pollution in the air. This extra carbon dioxide in the air is the main cause of global warming.

3. Possible answer:

We use petrol for generators and transport (e.g. motorbikes, trucks carrying food).

4. Possible answer:

We use firewood for cooking.

Note: In the carbon cycle, the carbon in plants and animals gets stored in the ground when they die. Over thousands of years, the carbon becomes fossil fuels people can burn for energy. When people mine them and burn them, the carbon turns back into CO_2 and goes into the air. Because huge numbers of fossil fuels are used in the world, there is a massive amount of CO_2 in the air and the carbon cycle is out of balance. There is a lot more CO_2 in the air than what can be managed through the carbon cycle. This causes many problems. It is thought to be a major reason for global warming.

Energy use

Discussion:

Discuss in small groups.

Possible answer:

Cars and aeroplanes use a lot of energy. The US is rich so many people own cars and fly in aeroplanes. Therefore a huge amount of energy is used for transport. In Myanmar, most people don't own cars. More people use public transport, walk or ride bicycles or bullock carts so very little of Myanmar's energy is used for transport. A big part of the US and Thai economies is industry. Industry uses a lot of oil so this is a big area where energy is consumed.

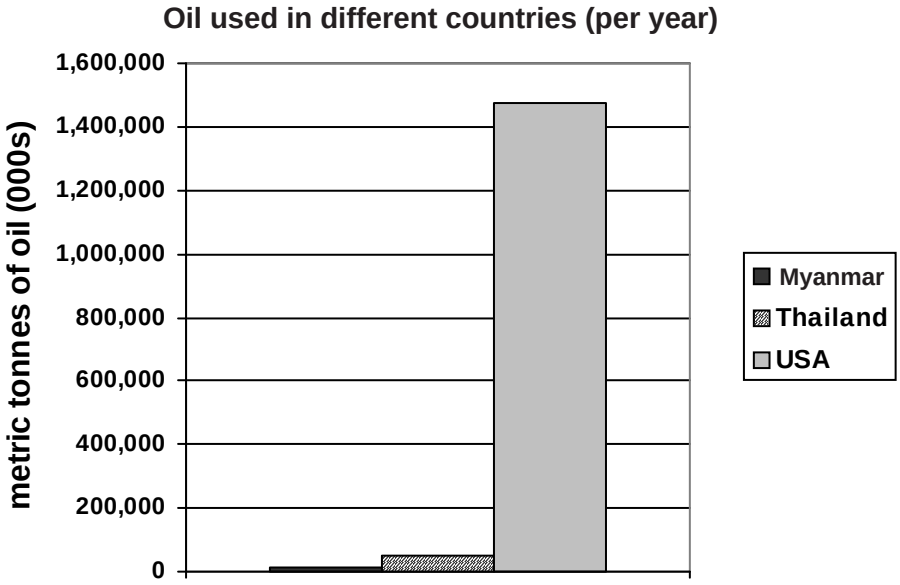
Note: The graph measures energy use by the amount of oil used per year in different sectors.

Activity:

Students work out the figures for the exercises, and draw the graphs. If this is difficult, encourage them to work in pairs or small groups.

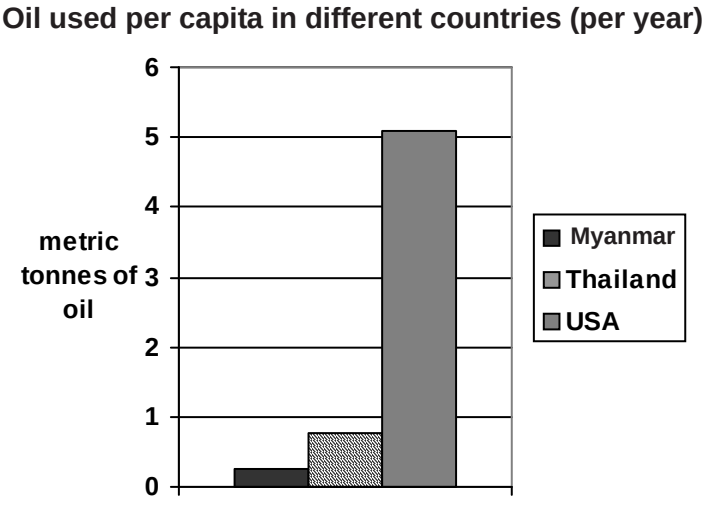
Answers:

1.



2. Per capita (per person) oil use: *Myanmar - 0.27 tonnes*
Thailand - 0.78 tonnes
USA - 5.08 tonnes

3.



Exercise:

Students write the answers, then check their answers as a class.

Answer:

Oil comes from undergound or under the sea. It is drilled and then transported by pipelines to refineries.

Discussion: Discuss as a class. Write students' ideas on the board.

Possible answers:

There would be less pollution. Transport would be very different. Maybe cars would use power from the sun. Energy could be cheaper if oil is replaced by accessible, non-renewable energy sources like wind, or more expensive if other energy sources are controlled by companies.

Hydroelectric dams

Additional reading 3: 'Pak Mun Dam: community action for the environment', page 43.

Encourage students to read the text and answer the questions for more information about the dam.

Exercise:

Students write the answers, then discuss as a class.

Possible answer:

Dams are a source of renewable energy because they take power from rivers. Rivers are renewed naturally through the water cycle.

Brainstorm:

Brainstorm in groups of three.

Possible answers:

Benefits	Problems
Renewable energy source	*Many people lose their homes around the dam*
Doesn't cause a lot of pollution like fossil fuels	*Threat to biodiversity in the river, e.g. fish can't migrate*
	Expensive to build

Firewood

Case study: Family Firewood Programme

Discussion:

Students discuss in small groups. Then discuss as a class.

1. Possible answer:

We use firewood for cooking. It comes from the forest.

2. Possible answer:

The forests are managed by the Forestry Department. We can cut down trees for firewood when we want to, but only certain species.

3. Possible answer:

Using stoves that are closed, only boiling the water you need, using small fires for heat, etc.

4. Possible answer:

Using charcoal, using open stoves or open fires, making big fires, etc.

5. Possible answer:

The programme is sustainable because it limits the number of trees taken. The trees have been grown for firewood so very old trees are protected. The forest is given time to renew.

Review:

Students write the answers, then check them as a class.

1. Possible answer:

Energy is generated by burning wood, fossil fuels or other things to make heat, or by the movement of things like rivers. .

2. Possible answer:

Renewable resources naturally replace themselves. They can therefore be used again and again. Examples are wood and wind. Non-renewable resources don't replace themselves or do so extremely slowly. When they are used, they are gone. Examples are fossil fuels.

3. Possible answer:

Everything needs energy to move. Energy is an essential part of life.

4. Encourage students to think about problems related to their own community such as *dams, deforestation, not enough firewood, cost of petrol, etc.*

5. Possible answer:

Walking instead of riding motorbikes. Not using a lot of plastic because it takes a large amount of energy to produce.

7. Climate change

Climate change is possibly the biggest environmental issue there is. In fact, many people think it is the biggest problem human beings and our environment have ever faced. It is connected to some of the topics already covered in this module, such as waste, biodiversity, deforestation and energy use.

Brainstorm:
Before reading the text, elicit students' ideas about what climate change is. If they don't know, tell them (*change of climate over time*).

Ask them how changes in climate are different from changes in weather (*weather is the conditions at a particular time, so changes are fast and temporary; climate is the normal conditions over a long period of time, so changes are slower and last longer*).

Then, as a class, briefly discuss what students think are the causes and effects of climate change. You can write them in two lists on the board. It doesn't matter if they aren't sure because they will find out later in the chapter.

The greenhouse effect

Activity:
Individually or in pairs, students match the numbers and letters.

Answers:
a. *2*
b. *1*
c. *5*
d. *3*
e. *4*

Exercise:

Students figure out the answers to the questions using the information in the text.

Answers:

1. *For living things, it is good. Without the greenhouse effect there would not be life on earth.*
2. *If there was no greenhouse gas, the earth would be very cold.*
3. *If there was too much greenhouse gas, the earth would become warmer.*

Natural climate change

Exercises:

Students read the sentences and decide if they are true or false. Students correct false sentences.

Answers:

1. *F - In the past the climate has changed.*
2. *T*
3. *T*
4. *F - The effects of volcanoes usually last only a few years.*
5. *T*
6. *T*
7. *T*

Human-made climate change

Exercises:

In any language, students explain how these things affect climate change.

Possible answers:

1. *If living standards are higher for more people, more fossil fuels are used, e.g. more people can afford cars or motorbikes that need petrol, they get houses with air conditioning, and they buy more products which are made using energy from carbon-based fuels.*
2. *Trees absorb carbon dioxide, so if trees are cut down, less carbon dioxide gets absorbed from the atmosphere. Also, trees store carbon. When trees are burnt or decompose, that carbon goes into the atmosphere as carbon dioxide.*

Exercises:

You might have to explain this graph to the students. The *y*-axis (the vertical line on the left) shows the deviation (difference) from the temperature in 1890. So 0.4 means the temperature was 0.4 degrees higher than in 1890, -0.2 means it was 0.2 degrees cooler than in 1890, etc. The right axis shows the CO_2 concentration, measured in parts per million (ppm). This tells us how much CO_2 there is compared to air. For example, 200 ppm means that for every million air molecules in the atmosphere, there are 200 CO_2 molecules.

Answers:

1. *In general, the temperature increased at the same time as the carbon dioxide concentration increased. They do not match exactly, however.*
2. *About 50 ppm.*
3. *About 60 ppm.*
4. *During the years 1900 to 1910 and the years 1942 to 1945.*

Exercises:

Many people think global warming, the greenhouse effect and climate change are the same thing. They are closely related, but it is important to understand the differences. Let students use their native language to answer these questions if they prefer.

Possible answers:

1. *The greenhouse effect is one of the main processes which helps to explain global warming. But it does not necessarily cause the earth to get hotter - it also helps keep the temperature stable. Also, global warming can have causes that are not directly related to the greenhouse effect, such as the earth's orbit and solar activity.*
2. *Climate change is about the climate changing in any way. It can mean hotter or colder, and it can also refer to other aspects of the climate, such as rainfall. Global warming is specifically about increasing temperatures.*

The effects of climate change

Discussion:

Briefly discuss this as a class. Don't worry if they don't have many ideas - they will learn more when they read the text in this section. However, make sure students know that we cannot say simply 'climate change caused the flooding in 2010' (or any other extreme weather event). It made it more likely to happen, and events like that will become more common as the earth warms up, but even without climate change these things happen occasionally.

If you have time and students are interested, you can tell them the following:

> *In China in 2010 there was much more rain than usual. Also, there was a drought before the rain which hardened the land so it could not absorb so much water. Since human-made climate change is affecting rainfall patterns, it may be partly to blame for the floods.*
>
> *However, it is not that simple. There had been a lot of deforestation in the flooded area, which reduced the ability of the land to absorb water. Also, the extreme weather can at least partly be explained by a natural weather pattern called* El Nino.

Exercises:

Students answer the questions using the information on pages 31 and 32.

Possible answers:

1. *Water from melting ice caps and glaciers is flowing into the sea, and the sea water is expanding as it gets warmer.*
2. *Sea level rise can cause flooding in low-lying areas. These areas are often use for food production so sea level rise may also cause hunger and food shortages. If people have to leave low-lying areas, other areas may become more crowded.*
3. *We don't know if climate change was the cause of cyclone Nargis.*
4. *Food production might decrease in some countries because agricultural land is destroyed by fires, rising sea levels, and natural disasters such as droughts and floods. In a few cooler countries, food production might increase because of better weather.*
5. *Some cooler countries, because food production might increase for a time.*
6. *Poorer, hotter countries, because they are affected more often by natural disasters, flooding and deforestation, and they have less money (and usually worse management) to fight it.*

Discussion:

Students discuss this in small groups. They decide which of these changes are likely to cause problems for their country and community, and why.

Example answers:

Country: *The Ayeyarwady Delta region of Myanmar is low-lying and could be affected by sea level rises, storms and cyclones even more than now. There is also some evidence that the monsoon is getting worse. In 2006 and 2007 there was bad flooding in Yangon and Mandalay after unusually heavy rain. This is likely to become more common because of climate change.*

Community: This depends on where the students live. For example: "*As we live near the sea, we are worried about rising sea levels and the effects of storms. Changing marine ecosystems could create problems for our fishing community."*

Activity:

In their groups, students choose one problem and make a cause-effect chain such as the example in the student's book. If you have large sheets of paper, get students to make a poster and present it to the class, and stick them on the wall afterwards.

Additional reading 4: 'Darfur: the world's first "climate change war"?', page 44.

This is a case study of some possible social and political effects of climate change. Encourage students to read the text and answer the questions. If you like, have a discussion in class.

Adaptation versus mitigation

Exercise:
Check students understand the meaning of *adapt* and *mitigate* in the context of global warming (*to adapt is to change some things so it doesn't affect us so much; to mitigate is to reduce climate change*). Check the students know what is in the picture on the left (*a concrete sea wall, built to protect the land from the sea during storms*).

Answer:
The picture of the sea wall shows adaptation because it does not try to reduce the problem; it just tries to limit the damage it can do. The man on the bicycle shows mitigation, because using transport that does not produce greenhouse gases is one way of reducing climate change.

Discussion:
Students think about how effective and realistic the ideas are, and some potential problems and solutions. They should be able to come up with some good ideas without knowing a lot of facts about them. It is very important they don't look at the next section when they are thinking, so tell them to cover that part. Possible answers are in the next section, but they may have other good points.

Discussion (on the next page):
Students discuss in groups and try to come to an agreement. They must use reasons to support their view. Ask each group for their ideas.

Mitigating climate change

Exercise:

Students match the headings with the boxes.

Answers:

1. **Reducing deforestation**
2. **Using alternative energy**
3. **Carbon capture and storage**
4. **Birth control**
5. **Reducing energy use per person**

Exercise:

Students think of advantages and disadvantages. They won't think of everything, but should be able to work out some. Below are some main points. You could give each topic to a group, get them to research it using Encarta, Simple English Wikipedia, textbooks, etc., then present to the class.

Possible answers:

1. **Reducing deforestation:** Advantages: *There are other good reasons for preserving trees, e.g. preserving biodiversity and resources for people in the forest. It doesn't require us to change our lifestyle much.* Disadvantages: *Some people will lose a lot of money if they can't cut down forests for timber or agriculture. Many of those people are quite poor.*
2. **Alternative energy:** The answer varies a lot between kinds of energy. **Wind/solar/wave power:** Advantages: *It's very cheap and easy to maintain after making the equipment.* Disadvantages: *The equipment is expensive to make. It only works in places with a lot of strong wind/sun/waves. It is more expensive than other kinds.* **Hydroelectric power:** Advantages: *It can produce a lot of energy.* Disadvantages: *It requires damming rivers, which can affect river life and people in the area that is flooded.* **Nuclear power:** Advantages: *It's cheap after building the power plant. It can produce a lot of energy.* Disadvantages: *It's very expensive to build the power plant and to safely get rid of nuclear waste. Radiation is dangerous and can kill people if it escapes.*
3. **Carbon capture and storage:** Advantages: *It is very effective at reducing carbon emissions from power plants. It doesn't require a big change in the way we live - we can still use energy from fossil fuels. This makes it politically easier.* Disadvantages: *It is very expensive, and it increases the cost of energy by about 30-60%, so energy users may have higher energy bills.*
4. **Birth control:** Advantages: *A lot of energy could be saved if there are less people. There are other advantages to having small families, such as a higher standard of living and less pressure on space and resources.* Disadvantages: *May require a big cultural change - some cultures think it is good to have lots of children, and don't like using contraception. If the government enforces it, like in China, people's freedom of choice is limited.*
5. **Reducing energy use per person:** Advantages: *It doesn't require governments to act - individuals, businesses and communities can decide to do it themselves. Sometimes it can save money and improve health.* Disadvantages: *It often requires a big change in the way people live. Each person can only save a very small amount of energy, and if a very large number of people don't do it, it is not very effective.*

Exercise:

Students think of three changes they can make to their lives to reduce carbon dioxide and greenhouse gases. Examples: *turning the TV off, not leaving it on stand-by; refusing plastic bags when they buy things from shops; re-using and recycling bags, bottles, etc.; using public transport instead of a car or motorbike.*

Group work:

Students work in groups to identify future problems climate change may cause. They also think of solutions and explain whether the solutions are adaptations or mitigation.

Into the future

Exercises:

Students read the information and answer the questions.

Possible answers

1. *China is the number one emitter of greenhouse gases because it has the largest population in the world and has lots of factories that produce the goods for other, more developed countries.*
2. *India creates less emissions than the EU because the standard of living for most people is much lower than in European countries, so people consume less and use less natural resources.*
3. *If China and India keep developing but don't reduce emissions, they will pollute more and more as the standard of living increases.*
4. *This question depends on the opinion of the student. Encourage students to give reasons for their opinion.*

Discussion:

Possible answers:

1. *Because each country was looking after its own interests and economy; it might have been too expensive for some countries to agree to reduce emissions quickly; some countries probably didn't trust other countries to ratify, and wait to see if they do or not; some countries probably thought that climate change should be solved by other countries.*
2. *This depends on the opinions of the students.*
3. *Ask students if they have any other ideas about what is a fair way to solve the climate change problem - reducing emissions based of number of people in the country, or by size of country, for example.*

Discussion:

Students discuss these questions in any language they like.

Possible answers:

1. Yes:
- *They have a duty to look after their own people first.*
- *Taking action may not be effective anyway.*

No:
- *The problem is too great for countries to think only about themselves - everybody will suffer if this happens, especially poor people.*
- *The people who are causing the problem for the whole world have a duty to fix it.*

2. Yes:
- *There is not enough time to wait for the USA and China to reach an agreement.*
- *Other countries reaching an agreement would be effective because emissions would fall.*
- *It may help persuade the USA and China to join in later.*

No:
- *The USA and China are the biggest emitters of greenhouse gases (33% of the total), so any agreement without them would not be effective.*
- *Other countries do not have as much of a moral duty to act because they are not causing as big a problem.*

3. *Climate change is likely to continue, causing many problems.*

Exercises:

1. Students look at the comments made and decide what the people meant, and why they said what they did.

Possible answers:

A. *Everybody has got something that they wanted; we got what we wanted; some small but important agreements have been made.*

B. *The meeting was not a success. People and the environment will continue to face major problems The rich countries did not take responsibility for the problems they have caused. Nobody could agree because every country thinks only about their own problems.*

C. *The meeting was not a success and I want people to know my feelings. People should have tried harder and I am disappointed that they didn't.*

D. *There should have been much more progress and lots more agreements made. Since the Kyoto Protocol in 1997, nothing positive has happened.*

E. *Nothing was achieved and the people responsible for its failure are like criminals. Powerful people should be punished for not doing enough.*

2. Students choose any leader who is relevant to the issue of climate change. It can be the leader of a country or of an organisation such as the United Nations. They write a letter using good evidence and reasoning to support their view. You can let them use their native language, if you can read it.

8. Development, people and the environment

Exercise:

Students discuss the questions in small groups. Write answers on the board.

1. Possible answer:

Development is the way things change to improve people's lives, communities and countries.

2. Possible answers:

Rural communities get smaller because many people move to towns and cities.
Agriculture changes because people use chemical pesticides and fertilisers and new methods. These chemicals can cause many health problems. They can also mean people can get bigger crop yields, make more money and get a higher standard of living.
New methods, technology and chemicals can mean that some people don't have to work as hard. They can spend less time working and more time on other activities.
More infrastructure projects such as schools, hospitals, transportation systems and roads can improve lives of rural people.
Some development projects like large dams destroy forests and river systems. This can destroy the livelihoods of many rural people.

3. Possible answers:

Dams and oil pipelines destroy forests, freshwater systems and other environments.
Using chemicals in agriculture pollutes the soil and rivers.
When people grow a lot of the same crop in one area, the soil becomes very unhealthy.
More education means people might have new knowledge or more knowledge about the environment.
More fossil fuels are used in transport and industry, which causes pollution and contributes to global warming.
Renewable energy sources can be developed, which limit environmental damage.

Exercise:

Students write their answers, then discuss as a class.

Possible answers:

Top-down development is when governments and international organisations make all the decisions about how development will be done. Community members are not involved in decision-making and have little power over their future.
Bottom-up development is when decisions about development are made by people in communities where development projects will take place. Everyone participates in decision-making about what happens. The government and international organisations listen to what communities say and act on it.

Rural communities

Brainstorm:

Students brainstorm in groups of four. They imagine what their home village, or a village they have visited, was like 100 years ago. Discuss these ideas as a class.

Students look at the pictures, and read the villagers' opinions.
What are the new problems for this village?
What things have improved?
As a class, list the problems and improvements that have happened over the last ten years.
They check their answers after reading the text.

Problems:

- Community forest is smaller
- They had to stop using shifting cultivation, and grow crops in the same fields. The soil in these fields is getting old and dry.
- The teak forest is 'protected' by the authorities so villagers can't use it. However, some businesses and villagers are cutting the trees secretly.
- They have to use new seeds, fertilisers and pesticides to try to get bigger crops. They have to spend more money on seeds. People get into debt to do this.
- Generators need petrol, which is expensive.
- Pollution from generators and traffic pollutes the river and crops.
- More rubbish. Some rubbish pollutes the soil.

Improvements:

- Roads improve access to other villagers, which mean more economic opportunities.
- Generators mean that people can do more - watch videos, listen to the radio and students can study at night.

Brainstorm some other possible problems and improvements as a result of development initiatives in this village.

Activity:

In pairs, students decide on an answer.

Possible answer:

This development process is top-down because villagers had no say in decision-making. The changes were from policies that villagers didn't have the power to influence.

Activity:

Students make a list individually or in pairs.

Answers:

- more economic opportunities for young people - can use radios and TVs more
- easier to pump water - students can do homework at night

Activity:

Students complete the table in pairs. They should start by summarising the problems in the text. After that, they think of causes and solutions to the problems. There are many possible ways to solve these problems. Here are some suggestions.

Possible answers:

problem	causes	solutions
Less land available for community forest.	*More land being used for agriculture.*	*Protect forests. Use shifting cultivation so forests are cared for by local people and it can grow back.*
Forest people losing access to forests.	*Laws restricting access to forests for conservation.*	*Use local communities to protect forests.*
Many people have debt.	*Cost of new hybrid seeds and the pesticides and fertilisers that go with them.*	*Stop promoting hybrid seeds and chemicals. Encourage natural methods instead.*
Pollution.	*New roads, more traffic, more rubbish*	*Encourage public transport.*

Discussion:

In small groups, students think about how development could work if it were bottom-up. What changes would they want if they lived in this village? Discuss this as a class.

Development alternatives

Students read the text. Explain anything they don't understand.

Roleplay:

Put the class in a circle. Students pretend to be villagers from this village.
They discuss the question and make a plan about how to spend the money.

Resource management

Project:

Put students in small groups. Tell them they will research an environmental issue in their community, or in an area they know well. This project focuses on natural resource management - if they are particularly interested in another issue, they can write their own project.

Encourage them to find the information by interviewing people in their community, and researching the issues using sources such as the internet, magazines and encyclopedias. Each person in the group should write a short report about what they find.

Additional reading 1

The largest poisoning in history

Note: Arsenic in soil is a naturally occurring process in some parts of the world. It only pollutes groundwater when people dig wells and use groundwater on a large scale in areas with large amounts of natural arsenic. When UNICEF started digging wells in the 1970s, there was no scientific information about the threat of arsenic. This is why the soil wasn't tested for arsenic at the time. Because of this, no legal action is being taken against UNICEF. However the British Geological Survey is currently being taken to court in London by a few thousand Bangladeshis. They dug wells in the 1980s and 1990s. At that time, there was scientific information about the threat of arsenic poisoning in groundwater but they failed to test the soil. They did a major safety check in 1992 but still failed to test for arsenic. This case continues.

Exercises:

Students read the text and answer the questions below.

1. Possible answer:

The environment affects human health a lot. For people to be healthy, the environment needs to be healthy. In Bangladesh, arsenic is natural but it is not natural to dig millions of wells. People, governments and organisations need to know a lot about the environment before doing big projects. This case in Bangladesh shows that the environment is very sensitive to change and changes in the environment can effect human health in serious ways.

2. Possible answer:

Arsenic in groundwater is a serious threat to ecosystems and biodiversity. It poisons aquifers which have many important functions in ecosystems. From aquifers, the arsenic can go into rivers and threaten freshwater biodiversity.

Additional reading 2

Fishing rights in Myanmar waters

Discussion:

Students discuss questions 1 and 2 in small groups.

Students discuss question 3 in pairs, then fours, then eights, then as a class.

1. **Possible answer:**

This could be terrible for saltwater ecosystems in Myanmar. Because there are no quotas, Siam Johnson and Co. could take a huge amount of fish, more than what is sustainable. This will put Myanmar's sea ecosystems out of balance. They also might catch endangered fish species and other animals like sea turtles. This will threaten biodiversity.

2. **Possible answer:**

This deal could make life very difficult for small Myanmar fishers and their communities. There will be less fish and fish will be harder to find. This can make it difficult for Myanmar fishers to meet their needs. If a lot of fish is taken, fishers need to travel further into the ocean to find fish. Small scale fishers have less equipment to do that.

Additional reading 3

Pak Mun Dam: community action for the environment

Discussion:

Students discuss in small groups.

1. **Possible answer:**
   The main problem with the dam is the impact it has on the Mun River. The dam stops fish from moving around which changes the ecosystems further down the river. This causes big problems for villagers who need the fish for food.
2. **Possible answer:**
   The main benefit of the dam is in providing electricity to Thailand. Also, HEP is fairly 'clean' electricity which doesn't cause pollution or contribute to global warming (see the following chapter for details).
3. Students talk about it and come up with their own opinions. Make sure they give reasons for their views.

Additional reading 4

Darfur: the world's first 'climate change war'?

Exercises:

Answers:

1. *True.*
2. *False. Many people believe climate change is one of the causes, but there are many others, such as ethnic divisions and a self-interested government.*
3. *False. Over the last 40 years the amount of rainfall and fertile land in Darfur have decreased.*
4. *True.*

Discussion:

Students discuss in small groups, then groups present their ideas to the class. Alternatively, have a class discussion. Below are some ideas but let students think for themselves.

Possible answer:

Darfur shows that environmental changes can have a huge effect on people. The environmental changes were in this case caused mostly by humans. Therefore the way people treat the environment can have a big effect on the well-being of humans.

Perhaps it also says something about how rich and poor countries are affected by environmental problems. Climate change was caused mostly by rich countries but poor countries like Darfur are affected the worst.

Another possible conclusion is that environmental changes would not have such a big effect if people were better at adapting to them. If the ethnic groups were not already divided, and the government was not making the problem worse for its own benefit, there would not be such a disaster in Darfur.

Species Cards for additional activity on page 9

Copy and cut these cards so that you have one card for each student. If you like, write the names of some other species in the bottom four cards, or get students to do this.

Mango Tree	**Deer**
Squirrel	**Wolf**
Python	**Fungi**

An Inconvenient Truth DVD

A Supplementary Unit on Global Warming

This module is based on the film 'An Inconvenient Truth'. The language in the film is quite difficult, so you should not expect your students to understand all of it. Half the film covers the science of global warming, and why it is an urgent problem for the world. There is also a lot of material about Al Gore, his family life, and his 2000 run for election as US President.

A lot of this movie is aimed at Americans, who are some of the biggest producers of greenhouse gases. However, there is a lot of useful information that is relevant for people in other parts of the world too.

There are no student worksheets for this module. Instead, write questions and activities on the board **before** students watch a new chapter of the DVD. After you have finished watching these chapters, students answer or discuss the questions. You may need to repeat the chapters two or three times.

Before You Watch

Write: What does 'An Inconvenient Truth' mean?

Let students look up 'inconvenient' in their dictionaries, then discuss the meaning of the prase. It means *'something that is true, but causes people problems'*.

Write: Who is Al Gore?

Do students know Al Gore? Get their ideas. If nobody knows anything about Al Gore, write these words on the board:

Presidential Candidate unsuccessful Democrat Party

Al Gore was vice-president of the USA under Bill Clinton. He ran for president, representing the Democrat party, in 2000. He lost to George W. Bush.

Chapter 1: to 6.31

Write: **1.** Al Gore says: 'I've been trying to tell this story for a long time, and I feel as if I've failed to get the message across'. What does this mean?

a) He has spoken about this issue many times, but people don't listen to him.
b) He is disappointed that he did not become US president in 2000.
c) He wants to send someone a message, but it never arrives.
d) He is very disappointed that he can't stop global warming.

2. 'There are good people in politics – in both parties - who hold this at arms length, because if they acknowledge it, then the moral imperative to make big changes is inescapable.' What does this mean?

a) Politicians don't want to do anything about global warming.
b) Both political parties have people who make good decisions.
c) If politicians say that global warming is a problem, they have to act.
d) Politicians can't escape easily from their political parties.

After the chapter, students discuss these in groups. *Answers: 1 - a, 2 - c*

Chapter 2: 6.31 to 8:53

Write: What gets us into trouble is not what we don't know, but what we know for sure that just ain't so.

Students discuss the meaning of this. Explain that Al Gore makes an example of this by talking about his primary school teacher. His 6th standard school teacher did not believe that Africa and South America used to fit together. When a student asked about this, he replied 'Of course not. That's the most ridiculous thing I ever heard'. These days, we know the continents were once joined.

It means that we get into trouble when we are sure we know something, but are wrong.

What other example of this does Al Gore give?

The Earth is so big, that we can't possibly have any lasting harmful impact on the Earth's environment.

Chapters 3 and 4: 8.53 to 11.48

Discuss: The cartoon was set in the future. How do you know it was set in the future? Do you think it offers a good solution to global warming?

The man mentions something that happened in 2063. Dropping giant ice cubes into the sea is not a good solution to global warming, as the greenhouses gases stay in the atmosphere, making the planet hotter and hotter (in the cartoon, bigger and bigger ice cubes are used).

Chapters 5 and 6: 11.48 to 16.42

Write: Why is there more CO_2 in the atmosphere during the Northern Hemisphere ?

Most land, and therefore most vegetation, is North of the equator. In the Northern Hemisphere's spring and summer seasons, leaves breathe in CO_2. In the Northern Hemisphere's winter season, the leaves fall and this $C0_2$ is released into the atmosphere.

Chapters 7 and 8: 16.42 to 20.22

Write: Glaciers are melting all over the world, including in the Himalayan mountains. Why is the melting of the Himalayan glaciers a particular problem?

Because 40% of the world (people in parts of Burma, China and India amongst other places) gets their drinking water from there. Rivers and springs are fed from these glaciers.

Glacier, Himalayan Mountains

Chapter 9: 20.22 to 24.54

Write: What is the relationship between CO2 levels in the atmosphere and temperature? Complete this sentence:

When there's a lot of CO_2 in the atmosphere, _____

Answer: ...the temperature rises.

What is going to happen to CO_2 concentrations in the next 50 years?

Answer: There's going to be much more $C0_2$ in the atmosphere than in the last 650,000 years.

There are people who disagree that global warming is a problem. They say that the earth's temperature has always changed in cycles. What is Al Gore's argument against this view?

Answer: There has never been so much CO_2 in the atmosphere before. Humans have put that there, and we are likely to see major temperature increases as a result.

Chapters 10,11 and 12: 24.54 to 34.16

Write: Match the questions and answers

1. When were the ten hottest years ever recorded?	**a.** types of storms
2. What happens when the oceans get hotter?	**b.** we get stronger storms
3. What are hurricanes, tornadoes and typhoons?	**c.** In the last 14 years

Discuss: Hurricane Katrina hit the Southern US in August 2005. Looking at the video footage from this hurricane, what were the consequences for people living there?

Make a class list of all the consequences you can see in the footage, e.g. *people drown, people have to leave their homes, the streets are flooded, etc.*

Chapters 13 and 14: 34.16 to 39.25

Write: The first minute of this chapter is the 2004 US presidential election. What happens in this election?

Answer: George W Bush beats Al Gore in the election, and becomes the US President.

What did Al Gore decide to do after the election?

Answer: To educate people about global warming.

Teach *precipitation* – any form of water that falls to the earth's surface (e.g. rain, snow, hail). Precipitation is the opposite of *evaporation.*

True or false?

1. In 2005, there was less flooding in India and China than previous years.
2. Global warming causes more flooding.
3. Global warming causes more droughts.
4. Global warming causes precipitation to move to different parts of the world.
5. Lake Chad has gotten larger as a result of global warming.
6. Global warming causes more water to evaporate from the earth.

Answers: 1. f 2. t 3. t 4. t 5. f 6. t

Chapters 15 and 16: 39.25 to 45.54

Write: The places where people live are chosen because of the climate pattern that has been pretty much the same on earth since the end of the last ice age. What does this mean?

a. People choose to live where the weather is the same all the time.
b. People choose places to live where they can stay for a long time.
c. People choose to live neat places that have a lot of natural resources.
d. People choose places to live based on knowledge of local weather over time.

Answer: d

Permafrost is soil that is permanently frozen.

Permafrost

List the consequences of the permafrost melting in the Arctic.

Answers: Trees that have roots in the permafrost are falling over
Buildings and houses are falling down
The gas pipeline is being damaged
Trucks can drive on the ice for less days each year
Winter is shorter, and summer is longer

What are the consequences of the ice-caps melting for polar bears?

Answer: Some of them drown, as there is not enough ice left for them to rest on.

Chapters 17 and 18: 45.54 to 51.27

Write: The annual average temperature of the world is about 58 degrees Fahrenheit. What will happen if this increases by 5 degrees?

Answer: It will increase 1 degree at the equator and 12 degrees at the poles.

The last two minutes of this section had different politicians giving their opinions of global warming. Do they think that global warming is a problem?

Answer: They think it is not a problem.

Chapters 19, 20 and 21: 51.27 to 101.13

Write: These animals, people and plants are having difficulty due to global warming. Match the animal, people or plant with the problem.

1. Birds	**a.** Before, there were no mosquitos in their cities. Now their cities are hotter, mosquitos are moving in.
2. Pine trees	**b.** Coral reefs where they live are 'bleaching', and no longer provide the necessary food
3. Nairobi residents	**c.** They are being eaten by insects. Previously, the insects were killed by the cold weather.
4. Fish	**d.** Caterpillars, that the chicks eat, are arriving earlier and are gone when the chicks hatch.

Answers: **1.** *d* **2.** *2* **3.** *a* **4.** *b*

What happens when sea-based ice melts or falls into the sea?

Answer: The sea level rises.

What will happen if the ice in Greenland and Antarctica melts?

Answer: Areas where millions of people live will be underwater.

Chapters 22, 23 and 24: 1.01.13 to 1.09.32

Write: Al Gore compares the situations in China and the US. What is similar?

Answers: They both use old technology that is dirty and polluting
They both follow bad habits and patterns from the past
The consequences of global warming for both countries could be very bad

At the moment, there is a collision (conflict) happening between humans and planet Earth. There are 3 factors causing this. What are they?

Answers: 1. Population 2. Science and technology 3. People's way of thinking

Chapters 25, 26 and 27: 1.09.32 to 1.17.02

Write: What is the main point of the last section?

a. Some powerful groups are trying to influence people to think that global warming is not a problem.
b. Scientists disagree about the causes of global warming.
c. Scientists are in danger if they speak out about global warming.
d. The government of George W Bush wants people to know that global warming is a big problem.

Answer: a

Chapter 28: 1.17.02 to 1.18.31

Write: Some people think we have to choose between the economy and the environment. What does this mean?

Answer: If we act to help the environment, then the economy will suffer. There will be fewer jobs, and people will have less money.

Why does Al Gore disagree with this idea?

Answer: Because if we destroy the planet, there is no reason to worry about the economy. Also because if we act to help the environment, this will create more jobs and more money.

Chapters 29, 30 and 31: 1.18.31 to 1.26.40

Write: Some people think that global warming is too big a problem to do anything about. What are Al Gore's suggestions for these people?

Answer: There is already the technology to solve global warming, if people decide to make some changes.

What is his message to Americans?

Answer: America has changed things for the better before. They can do this again.

Chapter 32: 1.26.40 to end

Write: What is the final message of this movie?

Answer: You can reduce your carbon emissions to zero, if you make some changes.

Which of these things are relevant for you? Which can you do?

Play the end part once or twice more, and students write down which of these suggestions is relevant to them and their lifestyles.

List some things you and your community can do to mitigate global warming.

Make a class list of ways your students can help reduce global warming.