

PACHAMAMA



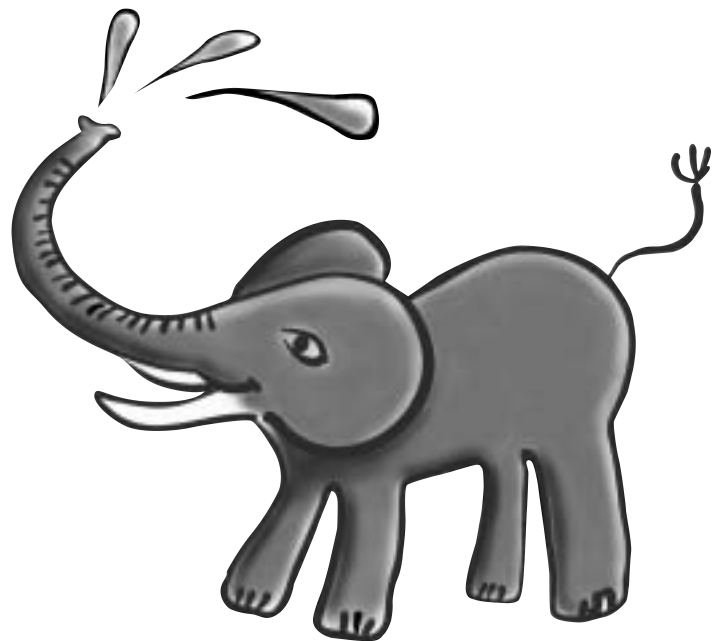
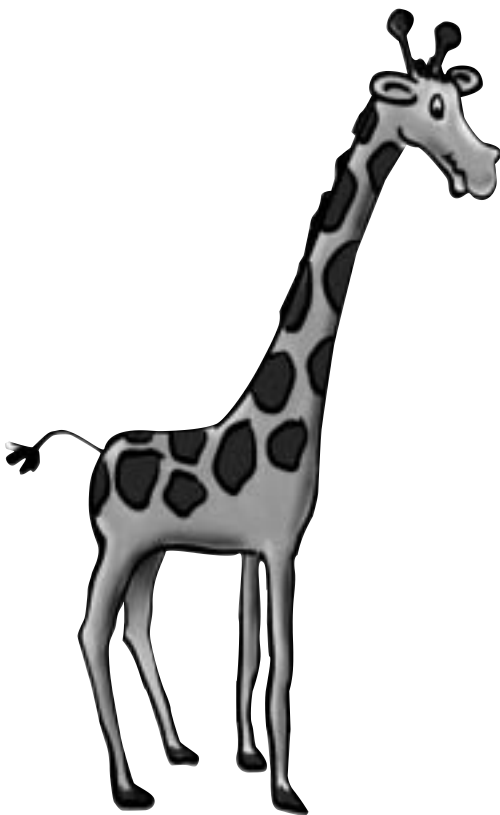
Teacher's Guide



To accompany PACHAMAMA: Our Earth – Our Future,
a youth publication based on GEO-2000 – the Global Environment
Outlook report of the United Nations Environment Programme

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Foreword



Our world is undergoing accelerating change, which seriously affects the environment. Carbon dioxide emissions are increasing, we are fertilising our Earth on a global scale and exposure to chemicals and other substances pose an increasing threat to the health of people and their environment. But there is also good news. Major reductions are being achieved in the use of ozone depleting substances and this is expected to bring about a recovery of the ozone-layer. Environmental management is moving in the right direction, but for many issues still too slowly. Changes are needed in the ways we think about the environment and the ways in which we manage it.

The United Nations Environment Programme (UNEP) endeavours to involve young people in environmental issues, stimulate environmental debate and promote a global culture of sustainability. *PACHAMAMA: Our Earth – Our Future* is UNEP's first global environmental assessment report written by young people, for young people. The idea to develop a *PACHAMAMA Teacher's Guide* has been there from the start. Many global environmental problems are rooted in local conditions and action by young people at the local level is a critical first step towards global solutions. Education - formal and informal - plays a vital role in informing and engaging young people.

We would like to acknowledge all the teachers, youth group leaders, school heads, educational advisors and students that helped us to develop the *PACHAMAMA Teacher's Guide*. In particular we are grateful to all schools and environmental youth groups that participated in the extensive piloting of the guide, which took mainly place in Africa.

We hope that the *PACHAMAMA Teacher's Guide* will inspire many of you to teach environmental issues and stimulate young people to think about the environment and to act in a way that will sustain our planet for the future. It is Our Earth, Our Future.

P Feedback

Please share your experiences with the *PACHAMAMA Teacher's Guide* with us!
Write to UNEP (GEO for Youth project) or send an e-mail to PACHAMAMA@unep.org





Introduction

Welcome to the PACHAMAMA Teacher's Guide. This product has been developed to assist you in teaching from the UNEP publication PACHAMAMA: Our Earth – Our Future, the youth version of UNEP's Global Environment Outlook (GEO) report.

PACHAMAMA is designed to introduce upper primary and lower secondary school children to major global environmental themes. Based on sound environmental information, issues are presented in a fun way to stimulate children to take action in their homes, schools and communities and to better conserve and protect the environment.

The PACHAMAMA Teacher's Guide is a tool for teachers, youth group leaders and other educators to take the stimulating materials from PACHAMAMA and teach environmental subjects in various ways. Although possible, the guide is not designed as a complete course that needs to be followed from A to Z. Rather, its main function is to provide a wide range of activities at different levels that could be taught within a wide curriculum. The guide is intended to help you in finding your best way to teach your students about the environment.

The teaching ideas included in this guide have been collected from around the world. The ideas will give teachers, youth leaders, environmental groups and other users inspiration and a framework to plan their lessons and activities. Clearly you will adapt them as you wish to fit your curriculum. It is our hope that some of the material in the PACHAMAMA Teacher's Guide will stimulate new approaches to teaching environmental education.

Environmental education

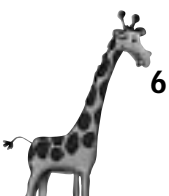
In 1977 governments agreed in Tbilisi, Georgia, that every child should receive full and comprehensive education about the global environment. Teachers have since endeavored to introduce their students to this complex and interdisciplinary subject. Traditionally, environmental subjects have been fitted into the natural sciences or geography curricula, and increasingly in citizenship and social education. Some educators have even made valiant efforts to introduce environmental issues into other subjects - "Write a poem about a rain-forest in French". Environmental education has the following goals:

- To foster clear awareness of, and concern about, economic, social, political interdependence at local, regional, national and international/global levels;
- To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment; and
- To develop and reinforce new patterns of environmentally sensitive behaviour among individuals, groups and society as a whole for a sustainable environment.

Environmental education has three basic components:

- Education in the environment: using the environment as a resource;
- Education about the environment: knowledge and skills;
- Education for the environment: values and attitudes.

Although all three components are important, the objective of Environmental Education is to influence values. You as the world's teachers have a critical role to play in guiding young people towards "Education for the Environment". This includes:



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promoting willingness and ability to adopt life-styles that respond to the wise use of environmental resources, and, building on education in and about the environment, to help develop an informed concern and sense of responsibility for the environment, through the development of environmental consciousness.

Education in and about the environment is valuable only in so far as it is used to provide skills and knowledge, to support education for the environment.

A sense of urgency

It is important not to scare children with doom and gloom scenarios about the future of our Earth. Instead, it is vital to stress that these problems are fixable - and that we have means to fix them. But, it is equally important to make clear to students that continuing as we are is not an option. The lack of planning in the use of resources results in severe and sometimes devastating environmental problems. The impacts of human action on the environment continue to be debated in many quarters. Caring for the environment has become a critical issue in our lives. People are an inseparable part of the environment. We have to learn to live and prosper while at the same time conserving natural resources and our environment.

The Teacher's Guide

The Teacher's Guide is intended to assist you in using PACHAMAMA as a supplementary resource for integrating environmental education objectives into your existing programmes. PACHAMAMA is not a textbook about the environment; it is a reference tool that contains:

- materials that you can use to motivate students
- sound information about the state of the environment
- experiences of other young people presented in a creative way

The Teacher's Guide makes extensive reference to pages, diagrams and passages in PACHAMAMA. Because PACHAMAMA was written and illustrated by young people all over the world, students will relate well to the material and perspectives. In order to appropriately use PACHAMAMA during the activities and to ensure that every child has an opportunity to read the book, we suggest a minimum classroom set of five books. To obtain an English copy of PACHAMAMA contact Earthprint (see details in the imprint page of this guide). In addition to the English version, PACHAMAMA is published in Arabic, Chinese, Danish, French, Italian, Japanese, Korean, Portuguese, Spanish, and Thai.

Although PACHAMAMA is the key resource for the children, wonderful sources of support are available through local environmental and social action groups, national and international NGOs, local authorities, education departments, and utility companies. Find out what resources they can offer and think about inviting speakers to come to your school or group. Students can organise these visits themselves: young people are our leaders when it comes to mobilizing people, encouraging families to re-cycle, making more environmentally friendly purchases, and making their travel and leisure decisions with the environment in mind. Let the students co-lead this course!

A global guide

The teaching ideas you will find in the Guide have been collected from around the world. You may find some of the activities more appropriate than others for your situation and region. We have intentionally included a diverse array of activities that will allow students to investigate environmental problems in their local community, while also raising their awareness of the challenges other regions in the world face. We are aware that not all activities within this global guide will be applicable to your classroom situation. However, it is our belief that the activities can be adapted to fit in with your local situation and





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curriculum needs. Some ideas about how to do so - based on the experience of an extensive piloting - are included in textboxes throughout the guide. We encourage you to use your own experience and be creative with activities.

Team-teaching!

Team-teaching is often thought of as two or more teachers working together to present a series of lessons to students. However, team teaching can also entail the teacher working together with the students to plan lessons and activities. It encourages co-operative characteristics necessary to stimulate young people to live in harmony with nature and each other. We recommend teachers to develop this cooperation so that their class can feel like a team setting out on an adventure to save PACHAMAMA. By building sustainability in the local community your students are thereby contributing to a sustainable future for the world.

Teaching Modules

The Teacher's Guide consists of a flexible set of 7 modules that can be used to supplement and enrich existing teaching programmes. It is not a document that has been designed to be strictly followed, but a supplementary resource to facilitate your work. Each module has been prepared as a guide for supplementing and reinforcing the information in the book. The seven modules address the following topics: atmosphere, freshwater, oceans, polar regions, forests, biodiversity, urbanisation, land use, environmental policies, emerging environmental issues and youth action. The length of each module is not indicated as we expect that teachers know the appropriate pace for their classwork better than we do and can thus decide on how many teaching units are required.

The Teaching Modules are divided into sub-topics that depict a logical format that can help you in using PACHAMAMA and teaching the environmental themes in different subjects. Each Teaching Module begins with a "Rationale" introducing the subject. This is followed by the module's "Aims" that explain the objectives, the flow of activities and traces the students' learning. The overview table depicting all of the module activities, with clear reference to the relevant pages in PACHAMAMA, may help you to select the activities you are interested in teaching.

Activities

At the beginning of each activity, a list of the materials and resources is provided. The target age group(s) are indicated and suitable curricula areas are listed along with step-by-step guidance on how to teach a topic using PACHAMAMA. Sometimes handout exercise sheets are required which you will find included in the back of this guide. Where relevant, reference is made to the safety instructions in Annex I.

Target Age Groups

Basic: 7-10 year olds
Intermediate: 11-12 year olds
Advanced: 13-14 year olds

The activities in the Teacher's Guide are targeted at students in upper primary and lower secondary years of schooling. The level at the beginning of each activity indicates the complexity of the activity. The final judgement of the level of the group is up to you as the teacher. The design enables you to utilize your creativity to "upgrade" activities to higher levels or "simplify" them to make them suitable for younger or lower-level students.

It is up to you to choose and adapt activities to fit in with the requirements of your syllabus, level of the students and the time you have available.



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Students can work individually or in groups to resolve environmental questions, issues and problems. This may involve a non-traditional approach to teaching and learning for some. The idea is to encourage students to actively engage themselves in critical complex problems and develop the aptitude to analyze. Please consider the following five interrelated objectives when preparing the activities for delivery:

- Raising awareness of the environment;
- Provision of knowledge and taking students through experiences;
- Assisting students in acquiring a set of values and feelings of concern for the environment to improve and protect it;
- Assisting students in acquiring skills to identify, anticipate, prevent and solve environmental problems;
- Encouraging active participation in environmental issues as opposed to abstract approaches.

Curriculum areas

Many of the Teaching Modules can be used in different subject areas in the school curriculum. Although different countries use different terms, this guide refers to the following basic categories: Art, Citizenship, Drama, Geography, History, Information and Communication Technology (ICT), Languages, Mathematics, Personal, Social and Health Education (PSHE) and Science.

“Environmental education is not to be added to educational programmes as a separate discipline or a subject for study, but as a dimension to be integrated into them. Environmental education is the result of a reorientation and rearticulation of the various disciplines and of various educational experiences (natural sciences, social sciences, arts and letters, etc) providing an integrated perception of the environment.”
Tbilisi Declaration, UNESCO-UNEP 1978

It is generally much easier to adopt an interdisciplinary approach in primary schools. In secondary schools, it is possible to link up two or more subject areas for a cross-curricular activity. If a class has a mathematics lesson after a geography lesson - combine the lessons into one and team-teach it with your colleague. Another suggestion is to link primary with secondary students for some cross phase activities. This is particularly good for final year primary and first year secondary students to give continuity during the often drastic transition from the “little” to the “big” school.

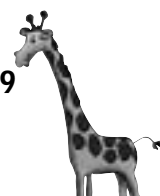
Be flexible and creative. Use local examples to make the lessons more interesting and situational.

Outcomes

Many of the activities have a practical product as a result, like school ground flora audits, waste charts, poems and so on. Keeping a record of this work means that it can be used as a resource for future students. In this way, the investigations and presentations will build up a valuable resource for your school. Young people's self esteem and sense of empowerment can be enhanced as well by knowing that their work will be helping their younger brothers and sisters in later years.

A final note to the target group

You are the world's teachers and the main target group of this guide. Your audience is your students in the primary – lower secondary years of schooling and the activities in the Teacher's Guide are developed to educate them about the environment. You are the “ambassador” of the activities in the guide. Good luck with your facilitators' role and enjoy the Teacher's Guide to PACHAMAMA.





Teaching Module 1: *Welcome on board*

Rationale

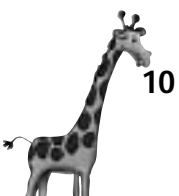
PACHAMAMA means 'Mother Earth' in Inca culture, but is much more than a word. It means living in total harmony with the Earth and not from the Earth. It suggests a lifestyle in harmony with nature.

The richest countries of the world have 20% of the world's population, but they use 60% of the world's energy resources. At the same time the population on Earth is growing. Scientists predict that the population will be around 9 billion people in the year 2050. With the present consumption rates, this will put the world's resources under enormous pressure. It is therefore a real challenge to think about our Earth and how our actions impact on the future.

Those who know about what is happening to the world are better equipped to do something about it. Education is therefore vital to the protection of the environment and subsequent achievement of sustainable development.

Module 1 Aims at

- Raising awareness of the local environment surrounding us;
- Providing basic tools to understand texts, discussions and so on, about environmental issues by teaching important keywords and pointing out the root causes of environmental change;
- Introducing students to key environmental concepts, specifically dealing with the issues of population growth and consumption;
- Enabling students to begin to explore their own natural surroundings and gain an appreciation of their environment;
- Looking at different environmental approaches to compare the role PACHAMAMA plays in various cultures.



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Objectives

- To introduce students to the meaning of keywords like PACHAMAMA, consumption, population growth, and other keywords related to the topic
- To give the students an appreciation of the environment - its beauty, its variety, its fragility
- To convey the main message of PACHAMAMA to the students

The following activities will enhance the students' knowledge, sharpen their observation of their surroundings and enable them to relate their learnings to their traditional and indigenous beliefs and attitudes, thus positively affecting their values in relation to the environment.

The table below indicates the activities for this module, the title and key content of the topics. It also provides guidance on the target group for the different activities of the module and indicates the sections in PACHAMAMA that are relevant to assist you in teaching the students.

Activity no.	Title	Key content topics	Target age group	PACHAMAMA
1.	Keywords	Introduction to environmental terms	Basic, Intermediate, Advanced	P. 8-13
2.	Experiencing Nature	Explore nature with our senses	Intermediate	P. 8-9
3.	The Circle of Life	Discover the local environment	Intermediate	P. 11
4.	Traditional or Indigenous Attitudes	Environmental attitude	Advanced	Inside front cover

Activity 1: *Key Words*

- Resources/Materials Needed: Notebooks, Pens.
- Target Age Group: Basic, Intermediate and Advanced
- Curriculum Areas: Languages, Geography, Science, Drama, ICT
- Methods Used: Role Playing, Acting Out





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Like mathematics, languages or any other field, environmental studies have their fair share of jargon. It is important for young people to develop their own glossary of key terms, which turn up frequently in discussions. This first activity gives them a chance to start their own glossary and explore critical environmental concepts.

Process

Step One: Planet Earth

- ▶ Set the scene on Spaceship Planet Earth.
- ▶ Ask students to choose one of them to be the "GEO Information Officer", the spaceship pilot.
- ▶ Invite him or her to read the pilot's message from page 10 of PACHAMAMA in front of the group.
- ▶ He or she then tells the other students to imagine that they are passengers on "Spaceship Planet Earth" and goes on explaining what the key controls are – the most important dials on the Planetary Dashboard. The following themes are the key controls:
 - Consumption
 - Population Growth
 - Sustainability

Step Two: Consumption

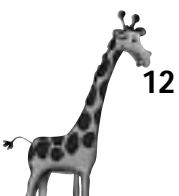
- ▶ Get the students to mime (pretend they are at) a great party: eating endless supplies of food, drinking sodas, dancing wildly and enjoying themselves - congratulating each other on their fashion styles, admiring their make-up, new stereo systems, wide-screen TVs and so on.
- ▶ After 10 minutes explain that all these things are elements of their 'consumption pattern'.

Note

Explain that some parts of the world consume a lot while others consume a little. This unfair distribution causes environmental problems. The parts of the world that consume a lot use a large amount of resources and energy, which can cause environmental problems, not only in their parts of the world but also in those parts of the world where people consume less.

Step Three: Population Growth

- ▶ Invite two students to come to the front of the class.
- ▶ Explain that they have three children - three students come to stand beside the first two.
- ▶ Create a second family - two more 'parents' who also have three children.
- ▶ The three children of the first family 'marry' the three children from the second.
- ▶ These three parents also have three children each...
- ▶ Continue until all members of the class are in 'families'.



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Note

Explain that this is "Population Growth". Then demonstrate how population grows more slowly if each set of 'parents' only has one child - especially if both parents die after the arrival of their first grand-child. Discuss what the consequences of population growth are for the environment.

Step Four: Sustainability

▶ Tell a short story to explain what sustainability is – for example an airplane, bus or car is filled with a certain amount of fuel before it takes off. This fuel will only last a certain amount of time before it needs to be replenished.

▶ Encourage the children to think up their own stories to illustrate sustainability. This will lead to the issue of "sustainable development". Sustainable development is the ability to meet the needs of today's generation without compromising the ability of future generations to meet their own needs (Our Common Future, Brundtland Report).

▶ If you feel your students are ready, raise the idea of sustainable development at this point. If not, the issue can be discussed in Teaching Module 6 and added to your glossary at that time.

Note

An airplane needs fuel to sustain its entire flight. If it flies for too long or too far, it runs the risk of running out of fuel. If the plane runs out of fuel, the flight or journey is unsustainable. Likewise, if you catch all the fish in a lake, there are no young ones to grow up, reproduce and sustain the fish stocks. If there are no fish to catch, the fishing industry collapses. The fish will disappear from the lake, and the fishing industry and the fishing villages built around the lake will suffer, as there is no work for anyone. Over-fishing is therefore 'unsustainable', for the fish and for the community that relies on the fishing industry. Instead of fish, teachers can use any examples that are relevant to their own environment to illustrate this point.

Step Five: PACHAMAMA

▶ Ask students to sit down - and then get each of them to tell, or write down on a piece of paper, what PACHAMAMA means to them. Almost every answer they give will be correct: it is the environment, it is the spaceship, it is the air we breathe, the food we consume, the water we drink, the radios we listen to... All are made of natural resources and all are in a way drawn from Mother Earth, and to Mother Earth they will return.

Note

Teachers in areas in which the word PACHAMAMA is not known will need to return to the explanation in the Rationale at the beginning of this module and reiterate the concept of PACHAMAMA.





To Conclude

- Have the class compile a glossary or dictionary of environmental terms and put it up on the classroom wall.
- Invite the students to make a note of their understanding of the key words discussed in this module in their notebooks.
- Develop exercises to explore other key words such as 'globalization', 'politics' and 'economy' as time allows.
- If your environmental activities last over several weeks or months, then select a time each week to explore a new environmental concept to add to the glossary.

Outputs: Dictionary or glossary of terms for a wall display in the classroom or school; An enhanced student understanding of the relationship between the environment and other issues and concepts.

Activity 2: *Experiencing Nature*

- **Resources/Materials Needed:** Several handkerchiefs or scarves to use as blindfolds, Pencils, Paper
- **Target Age Group:** Intermediate
- **Curriculum Areas:** Geography, Science, Language, Mathematics, Art, ICT
- **Methods Used:** Outdoor work, Pairing, Blindfolding
- **Safety:** Warn the students of any poisonous or stinging plants and remain in aware that someone may think it is funny to guide others to plants that sting or prick. There may be dangerous (poisonous) plants to touch, so everyone should thoroughly wash their hands afterwards. Be careful of dangerous garbage in the area, such as syringes, glass and so on.

Introduction

Half of the world's population today lives in towns and cities. Many city people have become disconnected from nature and their basic senses have been dulled. This exercise is designed to encourage students to use their senses to connect with their natural environment.

Process

- ▶ Take your students out into a garden or woodland outside the school grounds. If this is not possible, you can use the school ground or an area in the neighbourhood as long as there are some trees, grass and unpaved areas. For safety reasons, make sure that you are in a traffic free area.
- ▶ After defining the boundaries of the area and explaining safety issues, divide the class up into pairs.
- ▶ Explain that most of us experience the environment only with our eyes. This activity will enable the students to experience the environment through their other senses - sound, smell, touch. Give each pair a blindfold and invite one of the each pair to blindfold the other.



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▶ Then ask the sighted students to:

1. Lead the blindfolded ones by the hand to various elements of the environment.
2. Invite them to touch, feel, and smell the bark of a tree, a blade of grass, a flower, a leaf, a rock.
3. Encourage them to explain each sensation to their partner and give each item its name.

▶ After a short while, the partners should change roles and the other should assume the blindfold.

To Conclude

Upon returning to the classroom ask the students to describe the senses they used and what they recognized, perhaps with a picture of what they 'saw' through their nose, ears or hands.

Outputs: Descriptive writing/drawings about their different senses

Activity 3: *The Circle of Life*

■ **Resources/Materials Needed:** Several equal lengths of washing line or string, each 1 or 2 metres long; Field identification cards or books (if available); Pencils and paper or note books; Magnifying glasses (if available).

■ **Target Age Group:** Intermediate

■ **Curriculum Areas:** Geography, Science, Mathematics, ICT

■ **Methods Used:** Field Trip

■ **Safety:** See safety rules for Activity 2

Introduction

This is a great activity for the time of year when new growth is at its highest. It allows students to explore their natural environment at the very local, hands-on, down-on-the-ground level. This activity can be combined with Activity 2 in this module, while the students are outside, or carried out independently.

Process

▶ Take some cord 1-2 metres in length and tie the ends together.

▶ Divide the class into pairs and invite them to walk to a remote part of a field, or hillside and choose a spot.

▶ Ask them to toss down the rope in a circle and kneel down to examine what is inside the circle. Explain that each pair should make a list of all the different life forms they find within it - grasses, flowers, insects, seeds and so on.





To Conclude

Ask students to list down everything - and then compare notes at the end. See who found the most different things. Field identification cards can help students identify the plants and insects that they find. If field cards are not available then this would be a good project for the students to take on.

Ask students to make drawings and write descriptions of the flora and fauna that can be found specifically in or around the schools grounds.

These can be displayed on cards or in a book format to form a very useful resource for future lessons. Students can continue to add to their nature book throughout the year when new things appear as the seasons change.

Outputs: Field identification cards specific to the school grounds or very near locality.

Activity 4: *Traditional or Indigenous Attitudes*

"The frog knows not to drink all the water in the pond in which he lives." (Indigenous North American saying)

- **Resources/Materials Needed:** Library facilities; Internet; Museums; Relatives or friends
- **Target Age Group:** Advanced
- **Curriculum Areas:** History, Geography, Drama, ICT, Language, Science
- **Methods Used:** Brainstorming, Research, Creative Writing
- **Safety:** If students visit offsite resources such as museums, usual offsite safety rules must apply (see Annex I, page 84)

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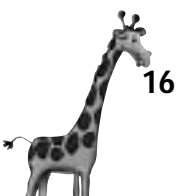
PACHAMAMA is a noun from Quechua, an indigenous language of Peru. The meaning of the word is Mother Earth, but as explained in the beginning of this guide and on the inside cover of PACHAMAMA, it means much more than that. It is an attitude towards the environment.

The task in this activity is to research and present a wall display of examples of the attitudes of ancient or contemporary indigenous cultures¹ towards Mother Earth. You may also wish to draw comparisons between the approaches you, the teacher studied, and the cultures the students in the classroom practice.

Process

- ▶ Ask one of the students to read the inside front cover of the PACHAMAMA book out loud.

¹ Present day traditional cultures and beliefs



Welcome



► Explain to the students that they will search for information on how (ancient) cultures regarded the Earth.

► Introduce the activity with a brief brainstorm of how your students can acquire information and ideas: old people in the community (for example grandparents) library resources, internet, information at home, museums etc. See also the extensive list of references to articles and websites at the end of the Teacher's Guide (page 84).

If students are unable to access additional resources, turn this activity into a creative writing exercise and encourage the students to create their own environmental approach and value system:

► Split the class in small working groups.

► Ask the students to explore their own traditions, their own culture, or the culture of, for example, indigenous Americans, Australian Aborigines, Incas, the Ju'hoansi or Bakgalagadi of the Kalahari, Basarwa (San) of Southern Africa or any other cultures they are familiar with.

► Give the students time to gather information. Each working group gathers information about one culture.

► Let every group present their results in front of the class.

To Conclude

Ask your students to take what they have learnt and suggest how ancient practices may be still relevant to modern lifestyles. This can further be elaborated by asking the whole group to draw up a code of conduct or "dreamtime" for how people should live today in a way that is protective and caring to the environment, based on what they have discovered from the above activity. The students can also compare their own personal, family, cultural or religious approach to the environment with the approach they have studied.

Outputs: Material suitable for an assembly or school display.

Question for Module 1

Homework assignment: Ask students to do some creative writing based on what they learned in Module 1. Here are some ideas to stimulate the students to carry out this assignment...

a) *The PACHAMAMA Story:*

Imagine Mother Earth taking on physical form and imagine what it would be like to meet with her. What would she look like? What would you talk about? What would be her major concerns and questions? How would you answer them? Where might you meet her? Think of a place where you meet her and describe the environment in great detail. Those students who are artistic might want to paint or draw a picture of her to go with their story.





b) The Spectacle Story:

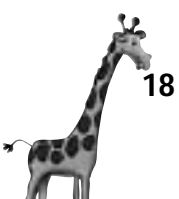
Imagine that you find some weird pairs of spectacles in your uncle's garden. The first pair are like powerful microscopes that allow you to see the molecular structure of everything - and all the strange tiny bugs in pond water and so on. The second pair are like X-ray glasses that allow you to see living things everywhere you look - the worms and moles in the ground; birds nesting in the trees; fish in the sea etc. A third pair allows you to see great distances - to see the deserts of Africa, the monkeys in the rainforest; lions sunning themselves on grasslands; polar bears padding across Arctic landscapes beneath the Northern Lights. Through the spectacles, each child will be able to see and imagine almost every aspect of the world's environment through its own lenses.

Ask the students to write what they see through (one of the) 3 pairs of spectacles.

c) The Alien:

Imagine that you are an alien (creature from another planet) floating through the universe and you arrive on Planet Earth. Describe all the things that you see as they might appear to an alien arriving on the planet for the first time.

Modupe One





Teaching Module 2: *Atmosphere and Freshwater*

Rationale

Until the Earth's protective atmosphere was formed, there was no life on Earth except in the seas. The atmosphere is vital for life. However, the quality of the air is damaged by gases from our daily activities like driving cars, heating houses and manufacturing products in factories. Besides the atmosphere, almost all living things need freshwater. Yet humans pollute and waste it recklessly. The quality of freshwater resources is declining due to pollution and the availability of water poses serious problems in large parts of the world. More than a fifth of the world's population does not have enough.

This teaching module relates to the subject areas "Atmosphere" and "Freshwater" in PACHAMAMA. The book provides a wealth of stories and case studies about the local environment of children around the world. After experimenting, investigating and learning about their own environment and the impact of environmental problems on human health, the stories in PACHAMAMA will be used to answer questions, thereby further influencing students to explore ways of taking action to protect the environment.

Module 2 Aims at

- Introducing students to a number of key environmental concepts in the subject area;
- Enhancing student understanding of the atmosphere and freshwater problems around the world.

Objectives

- To enhance understanding and application of key concepts relating to the environmental problems in the atmosphere and freshwater
- To enable an appreciation of the impacts on human quality of life and environmental quality of both atmospheric and freshwater pollution
- To enable identification and application of actions that may be taken to reduce this pollution
- To enable students to conduct and report a scientific experiment
- To enable an appreciation of the health effects of pollution, and how to take steps to avoid them





The table below indicates the activities for this module, the title and key content of the topics. It also provides guidance on the target group for the different activities and indicates the sections in PACHAMAMA that the activities relate to.

Activity no.	Title	Key content topics	Target age group	PACHAMAMA
1.	Measuring Pollution	Air and water pollution	Basic	P. 16, 18-21, 22-24
2.	Learning Key Words & Concepts	Ozone, acid rain, global warming	Intermediate	P. 17, 41, 62
3.	Human Health	Health indicators	Advanced	P. 16, 22, 27
4.	Water Use and Distribution	Water conservation, water management	Intermediate, Advanced	P. 22, 26-27

List of resources provided

Activity 2: Model for reporting an experiment - Handout page 76

Activity 1: *Measuring Pollution*

■ **Resources/Materials Needed:** Sellotape (Scotch tape); White paper; Pins; Red and green or blue pens; Glass jars; Map of the school grounds; Water samples from at least 6 sites from the local area; Map of the local area; Magnifiers or microscopes

■ **Target Age Group:** Basic

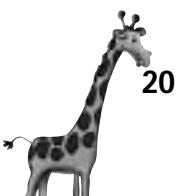
■ **Curriculum Areas:** Science, Geography, Mathematics

■ **Method Used:** Outdoor Activity, Working in Pairs

Introduction

Air and water pollution are among the major causes of death for children under five around the world. This means that sometimes the most dangerous things children can do are to breathe the air and drink the water in their local communities. It is possible to reduce pollution in both air and water. But before any action is taken to reduce pollution, it is important to know what type of pollution it is and where it comes from.

There are two very simple ways of measuring local water and atmospheric pollution. Both may be conducted safely by primary school age children. Through collecting samples, students will learn how to ask questions through investigation, make observations, and apply what they have learned to taking action.



Air & Water



This activity will enable students to investigate the levels of pollution in their community by identifying types and sources of pollution. What types of pollution are there and where do they come from? Answers to these questions are the only sound base from which to start.

Process

The Sellotape Test

The first test is about air pollution only. Although it is hard to assess what exactly the pollutants are, the test shows that all kinds of small particles are spread by air on the surfaces of all things on Earth, like buildings and the vegetation.

- ▶ Divide the class into pairs.
- ▶ Ask each pair to choose a site on the school grounds.
- ▶ Issue each pair with a small roll of sellotape or scotch tape.
- ▶ Ask students to:
 - Peel off a short section of tape (5-8 cm long)
 - Stick it on to a smooth, exposed surface – like a painted fence, a window pane, steel lamp post or smooth leaf
 - Pull off the sellotape and stick it on to a piece of white paper
 - Write beside it the date and the name of the location where it was collected.

Note

Suggest that each pair gets no more than 10 samples from their location.

- ▶ When the students go back to the classroom, set a scale for the findings: ten for the dirtiest and one for the cleanest.
- ▶ Ask each pair to mark their findings with pins on the map of the school ground.
- ▶ Circle the pins with red for the really dirty areas and green or blue for the cleaner areas.
- ▶ Discuss with the students the possible sources of pollution. These may be natural, like desert dust, or the result of human activity, like the smoke particles from factories.

The Secchi Test

The Secchi test is a similar test for water quality. For this to be effective there has to be a little practical preparation. The teacher or student technicians collect water samples from the local area and number the samples. A map is prepared with key features such as factories, sewage outflows, pine or eucalyptus plantations, residential areas, uncultivated and cultivated land, farms etc. and with the various sample locations marked.





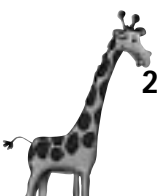
- ▶ Place the samples in clear glass containers, such as boiling tubes or drinking glasses.
- ▶ Show the students the different numbered samples and the map of the neighbourhood where the samples came from. The map does not indicate which sample came from which point.
- ▶ Explain to the students that all the samples came from the marked points on the map.
- ▶ Ask the students to work in groups of 4-6 and hand out a copy of the map.
- ▶ Students can then discuss and predict where the various samples came from and indicate the number of the sample on the map.
- ▶ Once their origins are agreed, the teacher writes the name of the places where samples were collected on sheets of white paper and line the sheets up along a table.
- ▶ Place the samples beside each other, and judge them on a scale of 1 to 10 - ten for the dirtiest - one for the cleanest.
- ▶ Ask the students to mark the sites with colors (red for the dirtiest and blue or green for the cleaner samples)
- ▶ Compare the outcomes and discuss where the dirtiest water comes from on the map of the local area.
- ▶ If you have access to magnifiers or microscopes ask the students to examine what is in the water that makes it cloudy.
- ▶ Ask the student to write down notes or make drawings of what they see.

To Conclude

Explain that this assessment of water and air quality was based on what we can see with our eyes, or maybe smell. Researchers of the environment use various methods to assess the quality of air and freshwater. They measure for instance also the incidence of chemical substances in the air (for example sulphur content in industrial areas causing smog or acidification), or test the amount of oxygen in water (measure used to assess eutrophication by suffocating algae).

Additional research methods are often necessary to assess the quality of water or air. Water is also the place where many insect larvae and tiny algae live, which provide food for fishes and other freshwater organisms. Explain to the students that it is therefore necessary to study what makes the water cloudy and that scientists use guides to determine the kind of species. Some species are indicators for bad water quality whereas others are only present in very healthy waters.

Outputs: A map of local air and water pollution. Over a period of a year a valuable comparative study can be compiled using the samples.



Air & Water



Activity 2: *Learning Key Words and Concepts*

■ **Resources/Materials Needed:** Sellotape (Scotch tape); An old umbrella that you can cut up - or an old piece of cloth; 12 plants (these can be grown from seed as a prior activity); 2 liter flasks; Lemons; Water; Large glass jar or 5 pieces of glass about 30 cm by 30 cm; 2 small vessels; Thermometer (preferably alcohol, not mercury); Atlas or world map; Handout page 76

■ **Target Age Group:** Intermediate

■ **Curriculum Areas:** Science, Geography, ICT, Art, Language

■ **Method Used:** Experimentation, Report Writing

■ **Safety:** Make sure that the umbrella or cloth is far away from the student underneath when the other two students are cutting a hole in it. Be also very aware of the fragility of the glass the students are using. Supervise the use of a mercury thermometer.

Introduction

Climate dictates much of the way the world is. All over the planet climate differs and human activities, such as agriculture, have developed according to local climatic conditions. Just as humans are influenced by the climate, they have also influenced our global climate. The increasing number of people and economic development continue to cause adverse affects for the global environment.

This activity will allow students to understand key environmental issues and visualize the impact human actions have on global atmospheric and water problems. The questions at the end of this module will stimulate the students to think about the impact of their daily activities on the environment.

Activities that follow are chosen to explain three core concepts related to our atmospheric environment: ozone depletion, acidification, and global warming. Although these terms are frequently used, very often concepts like ozone depletion and global warming are confused. All three environmental problems are linked to processes in the atmosphere that are altered by the behaviour of humans. Activity 2 aims at explaining the different concepts to the students. You may wish to begin, or conclude, this activity by reading the Atmosphere pages of PACHAMAMA (pages 16-17).

Depletion of the Ozone Layer

The Ozone Layer is a layer in the upper atmosphere where a form of oxygen with three atoms in a molecule (called ozone) is found. This layer protects us from harmful ultraviolet (UV-B) radiation from the sun. In the seventies investigators observed a "hole" in this layer at the poles. The cause of this hole turned out to be the use of substances which destroy ozone (known as ozone depleting substances), in particular the chlorofluorocarbons (CFCs). As a result of the reduction of this layer the UV-B radiation that reaches the Earth increases. This causes increased skin cancer risks and eye problems.

The depletion of the ozone layer is a clear example that the environment does not have national boundaries. CFCs were mainly used in industrialized areas, but its effect concentrated at the polar areas. Figure 2.1 shows the current ozone losses and increase in UV-B as presented in the GEO-2000 report (page 27).





Fig. 2.1. Current ozone losses and UV-B increases (GEO-2000)

	Ozone loss (%)	UV-B increase (%)
Northern hemisphere, mid-latitudes, winter/spring	6	7
Northern hemisphere, mid-latitudes, summer/autumn	3	4
Southern hemisphere, mid-latitudes, year-round	5	6
Antarctic spring	50	130
Arctic spring	15	22

Note: Figures are approximate and assume other factors, such as cloud cover, constant
Source in GEO-2000: WMO, NOAA, NASA and EC (1998)

Acidification

Sulphur dioxide resulting from sulphur emission is washed out the atmosphere as acid rain. Acid rain causes acidification. This is the process by which soil and water become acidic.

The change of acid levels in soils has a large impact on life in lakes and forests, but it also causes crop losses. One of the main causes of sulphur emissions is the burning of sulphur rich fuels, like coal. Although strenuous efforts have begun to abate acid rains in many European and North American countries, emissions in other regions, like Asia, are a major and growing problem.

Global Warming

Global warming is the process whereby the average temperature of the atmosphere increases due to the increase of so-called greenhouse gases in the atmosphere.

The atmosphere can be compared with a blanket that keeps the Earth warm. Heat from the sun is not immediately released to outer space, but is trapped by gases in the atmosphere of the Earth. One of these trapping gases is carbon dioxide (CO₂). Mainly due to the burning of fossil fuels, the concentration of CO₂ in our atmosphere has increased significantly (figure 2.2). However, the contributions of different parts of the world differ considerably. Figure 2.3 shows CO₂ emissions per capita expressed in tonnes per year, for 1975 and 1995 (from the GEO-2000 report).

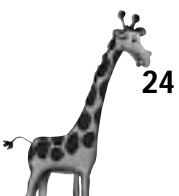
Global warming is expected to have an impact on many things: melting of polar ice, an increase of the sea level and more frequent and intense weather events, such as storms, typhoons and so on. Climate patterns will change and this will also have an effect on the growth of plants, the spreading of species and on the Earth's ecosystems as a whole.

Global warming is often referred to as the "enhanced greenhouse effect". A greenhouse is a good metaphor for the warmth retaining function of the atmosphere.

Process

The Hole in the Ozone Layer

- ◆ Bring an old - really old! - umbrella that can be cut up, or a piece of cloth to the classroom.
- ◆ Ask one of your students to volunteer to sit underneath the umbrella on a table at the front of the class.
- ◆ Then carefully, with a pair of scissors, get two other students to cut holes in the umbrella.



Air & Water



◆ Shine a powerful torch or spotlight (or sit outside in the direct sunlight) through the umbrella or piece of cloth so that the children can see the dappled effect on the child sitting underneath it.

◆ Ask one student to read Ling Si Low's quotation on page 17 of *PACHAMAMA* – and explain, based on the information above, how the ozone layer protects us from the harmful ultraviolet rays of the sun:

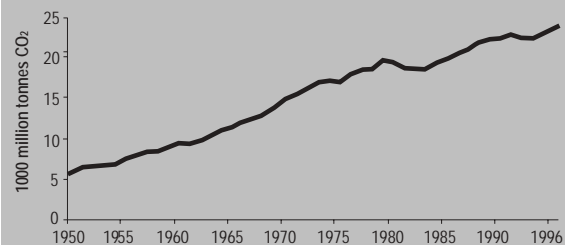
- Apart from the warm sun light, other rays from the sun approach the Earth.
- One type of radiation is ultraviolet or UV-B.
- This causes skin problems (think of sunburn) and eye problems (eye cataracts).
- This harmful radiation is kept away from the surface of the Earth by the ozone layer.
- However, this layer becomes thinner, especially near the polar areas, so our protection becomes less.

◆ Invite students to think about what can be done about this problem. Apart from using sun cream, the emission of the gases that damage the ozone layer should be stopped.

◆ Tell the students that most governments have agreed to stop the production of CFCs that damage the ozone layer.

◆ Ask if the students know in what products these gases are used?

Fig. 2.2. Global CO₂ emissions



Source in GEO-2000: compiled by UNEP GRID Geneva from CDIAC 1998 and WRI, UNEP, UNDP and WB 1998

Acid Rain

Set up an experiment with two comparable groups of each six plants, group A and B: use the same soil for all plants, use plants in similar health and of the same age and so on.

◆ Prepare two flasks of water: one with tap water and one with tap water plus the juice of a squeezed lemon in it. Mark the flasks respectively as A and B. Explain to the students that flask B will simulate the acid rain.

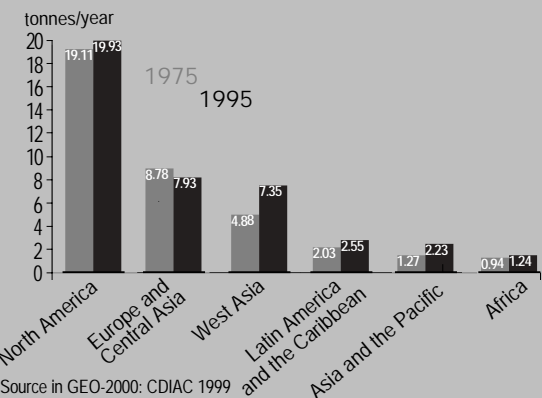
◆ Water each group of plants equally with their assigned flasks: use flask A water for group A plants, and flask B water for group B plants.

◆ Ask the students to work in six groups and to continue the experiment for two weeks (or until dramatic results in the degeneration in the health of group B plants are shown). Each group is watering one pair of plants (A+B).

◆ Discuss the differences between the two groups of plants after two weeks. Make an inventory of the differences observed and ask the students to explain the differences. Differences can be observed in freshness of leaves, colour of leaves, plant growth etc.

◆ Explain to the students that the outcome of their experiment is comparable with what has been observed in forests that were damaged by acid rain.

Fig. 2.3. CO₂ emissions per capita



Source in GEO-2000: CDIAC 1999





▶ Use this as an opportunity for the students to really apply the 'scientific research method' to their investigations in describing the experiment in a report. The students should include the following: Introduction, Aim of the experiment, Hypothesis, Materials and Methods used, Results and Conclusion.

The Greenhouse Effect

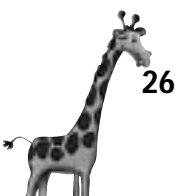
To do a simple experiment to explain the working of a greenhouse:

- ▶ Get a large glass jar or construct a glass box out of some panes of glass.
- ▶ Place a small container of water under the glass and put another just outside it.
- ▶ Leave both in the sunlight and then, at the end of the day, take the temperature of the two containers. Let the students find out which is warmer and why this is the case.
- ▶ Experience drawn from the experiment or from people who have visited a greenhouse can be applied to other examples of insulation such as clothes, sleeping bags, hot water tank jackets etc, to illustrate heat retaining qualities and effects. Explain that carbon dioxide gas does the same thing to heat within the atmosphere and give examples based on the information above.
- ▶ The consequences of the heating of the atmosphere can be discussed back in the classroom, using a world map. Predict which areas and which people will be affected most by the melting polar ice or alpine glaciers: sea level rise will affect low lying areas – small islands might disappear, coastal areas are threatened, etc. For more information about the effects of global warming see PACHAMAMA pages 58-59.
- ▶ Instruct the students to write up a full report including the following details (see handout page 76):
 - Aim of the experiment
 - A brief description of the experiment and the results
 - Comparison between the experiment and global warming
 - Impact of global warming on Earth using PACHAMAMA page 17

To Conclude

All three of these experiments encourage students to become more familiar with atmospheric changes and to be able to differentiate between these three global problems. As a follow up, you may wish to encourage your students to look locally at how your region, or country, is affected by these atmospheric changes. Allow them to explore the local context in a homework or library assignment, and if these resources are unavailable, they can use their imagination to write creatively about how their home might be affected by these changes. The students can look for present or predicted examples in their country of the impact of climate change (floods, droughts, warmer seasons, hurricanes), ozone depletion (development of CFC friendly products, increase in health risks, public awareness campaigns), acid rain (forest degradation, water contamination, degradation of national monuments). This will allow the students to bring these global issues down to the local level.

Output: A well designed investigation and report.



Air & Water



Activity 3: *Human Health*

- **Resources/Materials Needed:** Local Health Report
- **Target Age Group:** Advanced
- **Curriculum Areas:** PSHE, Science, Geography, ICT, Art
- **Method Used:** Role Playing, Investigation/Research, Report Writing

Introduction

Health and the environment are closely linked. As pollution levels rise and spread more widely across our world, we see the effects on the health of not just PACHAMAMA (Mother Earth) but ourselves as well.

We already mentioned water and air pollution as main cause of child mortality. Other examples of health problems are skin cancer from exposure to ultraviolet light, impaired child development from lead in the atmosphere, more cases of asthma in young people, and more typhoid and cholera after floods. All these are on the rise. This activity encourages students to investigate the environmental problems that could lead to health concerns in their community.

Process

Imagine you (the teacher) are an Environmental Health Consultant who has been awarded a contract to assess the health of the community. A final report will have to be submitted by a deadline to the Local Health Authority. Their costs have been increasing as more and more people in the local community are suffering ill health. The Health Authority has an idea that it is connected to the obvious deterioration in the local environment. They want to identify causes and receive suggestions for action to improve the state of the community environment, thus reducing illness and therefore costs.

- ◆ Prepare a questionnaire based on a local health report.
- ◆ Introduce yourself to the class as an Environmental Health Consultant. Inform the class they have been selected to help the Local Health Authority determine the sources of health problems in their community.
- ◆ Split the group up into separate groups, or "Agency Teams", of 5-6 students, each producing a separate report.
- ◆ Ask the students to answer the questions in the next week: some of the questions can be answered by the students themselves while other answers will come from questioning their peers, families and the general public.
- ◆ Explain to the students that the questionnaire aims at researching what the local environmental problems are, where they occur, at what times of year, and what, if any, is their direct link to health issues.
- ◆ Collect all the questionnaires and sum up the outcomes on the black board.





▶ Discuss what kind of environmental problems occur in the local environment. This can be done through the results of the questionnaire, but can also be done by seeing what issues come up from the students' discussion in the classroom.

▶ Ask each group to analyze the results of their own investigation and make a report of their findings for the "Local Health Authority" (teacher).

To Conclude

This activity allows students to investigate their surroundings and to determine the origin of environmental and health problems that may plague their community. It provides them with a sense of empowerment, to be able to identify the problems and make a report of their findings. Some of the problems they find may be connected to other activities in this Teacher's Guide. For example, if students find their school grounds are filled with waste, you may wish to connect this activity to Module 5 - Activity 3: "Taming the Garbage Monster".

Outputs: A well designed investigation and report.

Activity 4: *Water Distribution*

- **Resources/Materials Needed:** Library and/or web resources; Information on other countries
- **Target Age Group** - Intermediate, Advanced
- **Curriculum Areas** - Science, Geography, Art
- **Method Used** - Group work, Presentations, Discussion

Introduction

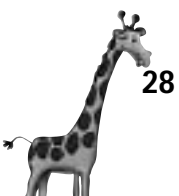
Most often, environmental problems continue to grow because people are not aware of the impact of their actions. This activity allows students to examine their own water use inside the home to determine how they already conserve water, and what they can do to save more water in the home.

It also allows the students to compare the water practices and problems they are accustomed to with the water challenges faced in other countries, regions, or provinces. By doing so, the students can then compare the local to the global to find solutions in both areas.

Process

▶ Give the students a homework assignment to start on. Ask them to trace how much water they use in one full 24 hour day (they may not be able to get actual amounts, but they can at least talk about what they used water for and how). To give the children some direction, create a questionnaire that they can take with them. Some suggested questions are:

- How much water do you drink?
- Where does the water come from? Do you have to boil it first?



Air & Water



- Do you take a bath or shower? How long takes it to shower? Do you leave the water running when brushing your teeth and washing your face?
- How does your family save water? Does your family waste water?

▶ Read the “Squeezing our Planet Dry” piece on page 27 of PACHAMAMA.

▶ Divide the class into pairs or groups and give each group a country to study. Compare different global regions, but make sure to include several countries from your own region. If you prefer, and the information is available, encourage the students to study different provinces or states, in your own country. Their assignment (either as homework or a library session or an internet study) will be to learn:

- How much freshwater is available in the country?
- How much water is used every year?
- Does the country have a water problem, such as droughts, floods, pollution?
- What sector uses more water: industry or agriculture?
- How can water be saved?

Note

Feel free to add additional questions. If research materials are not available, use the examples of water problems in countries provided by PACHAMAMA, pages 26-27.

▶ Each group will give a presentation in class presenting their findings. The class will discuss how countries face similar, or different, water problems.

▶ Ask the students to think back to how much water they use in a day and how that compares to people in the country they studied. They can then compare the international and local examples by considering the following questions:

- How can you save water in your own home?
- How can your country's water problems be solved?
- Can the country you studied learn from how you conserve water in your own home?

To Conclude

This project allows students to study their local environment and personal use of water. In addition, they become aware of the different water problems countries face around the world. In the end, the students can see how their water conservation can be improved, but also offer suggestions on how the country they studied can save water. If you wish to continue this project, encourage the students to develop a water conservation campaign for the country they studied. The key to changing environmental attitudes and practices is through education. By developing a water conservation campaign, the students become the teachers and help teach others how to save water.

Outputs: A comparison of water problems facing different countries; A comparison of local and global water issues.





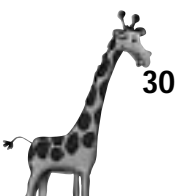
Questions for Module 2

Students can use PACHAMAMA to answer the questions.

1. Read "Smog in the Mind" on pages 20-21.
 - Make a list of causes and of effects given by the authors.
 - What do people do to protect themselves from air pollution?
 - Could you answer the question the author of "Not my fault!" asks him or herself?
2. What do you think people mean when they talk of ozone 'friendly' and 'unfriendly' products?
3. Is it possible in the place where you live, to purchase ozone friendly and unfriendly products? How do you recognize the difference between these products?
4. Do you know what kind of fuel is used in your country? Do you think this causes acid rain?
5. Use the texts on pages 24-27 of PACHAMAMA to answer the following questions:
 - a. Describe what kind of things are found in polluted water.
 - b. What are the consequences of polluted water in many countries?
 - c. Do you know what El Niño is? Did you experience anything of this weather phenomenon?

Solutions

1. Answers can be found in the text.
2. A product is regarded as ozone unfriendly if it contains CFCs, like some sprays, deodorants and refrigerators.
3. In Europe and North America CFCs are banned in products. In other parts of the world ozone unfriendly products can still be found on the shelves in supermarkets or electrical goods shops. Ozone friendly products are marked with a "CFC free" label so that consumers can recognize the product as ozone friendly.
4. Coal contains a lot of sulphur. "Cleaner" fossil fuels are oil and gas. The production of hydro power and wind power is not associated with the emission of sulphur at all.
5. Answers for a) and b) can be found in the text. Explain that water pollution results in "water borne diseases".
 - c) El Niño is a naturally occurring ocean condition resulting in major changes in weather and biological productivity. Both cases on PACHAMAMA page 27 refer to the situation the 1997-98 El Niño caused: one in Kenya and one in Peru. Explain to the children that it is usually much drier in African countries like Kenya. Link this to the water consumption in different regions in the world as given in "Squeezing our Planet Dry" (page 27).





Teaching Module 3: *Oceans and Polar Regions*

Rationale

Oceans and polar regions are two areas that sometimes seem to be so far from us, whereas at the same time we influence the state of the environment in these areas with many of our daily activities. The environment does not have borders comparable to the borders of countries. The consumption of particular goods in one place can affect the environment in another place. PACHAMAMA gives some examples of this: it tells for instance how the consumption of CFCs (chlorofluorocarbons) resulted in the hole in the ozone layer over the Poles. The oceans are in a similar way affected by our activities on land. About 75% of the pollution of the sea comes from land based sources!

Although the problems facing polar regions often originate from other parts of the world, these environmental issues have not received a lot of attention because they are observed and felt in far off regions. Activities in this module will heighten students' appreciation of the inter-related nature of the environment in different regions.

Teaching Module 3 focuses on two subject areas of PACHAMAMA: "Marine and Coastal Areas" and "Polar Regions". In the course of the activities, the impact of humans on ecosystems is put forward to present how humans alter the marine and coastal environment and polar areas, and their natural processes.

Module 3 Aims at

- Encouraging students to visualize the world as a global interconnected system, and to recognize that their actions have an impact on far off regions that they cannot see;
- Enhancing the students' understanding of ocean ecosystem and how its species interact;
- Enabling students to realize how humans alter the coastal and marine environment and its natural processes;
- Focusing on the polar regions and how their pristine existence is disrupted by human activities originating from other regions.





Objectives

- To increase the knowledge of students, most of whom will live far from polar regions, of ocean and polar environments
- To make students aware of the fact that actions thousands of miles inland affect the ocean environment
- To understand and apply key elements of ocean geography - coral reefs, mangrove swamps etc.
- To understand and apply knowledge of possible solutions to major threats to coastal and marine ecosystems and polar regions
- To facilitate understanding of the important role that polar regions play in the balance of our planet's climate and ecosystem

The table below indicates the activities for this module, the title and key content of the topics. It also provides guidance on the target group for the different activities of the module and indicates the sections in PACHAMAMA that the activities are relevant to in order to assist you in your teaching of the students' text.

Activity no.	Title	Key content topics	Target age group	PACHAMAMA
1.	Aquarium Visit	Raise awareness about sea life	Basic, Intermediate, Advanced	P. 28-29
2.	Make an Ocean World	Activities in the ocean and relations between them	Basic, Intermediate	P. 28-31
3.	A Whale in my School Yard	Sea mammals	Basic, Intermediate, Advanced	P. 30, 59
4.	Turtle Drama	Impact of human activity on ocean life: a case study	Intermediate	P. 32-33
5.	Polar Regions A Guided Fantasy	Imagination of polar ecosystems	Intermediate, Advanced	P. 58-59

Lists of resources provided

- Activity 3: Outline Blue Whale - Handout page 77
 Activity 3: Food web in the Oceans - Handouts pages 78 and 79



Oceans



Activity 1: *Aquarium Visit*

- **Resources/Materials Needed:** Aquarium; Library visit or journals, Magazines, Books; Internet, Videos, Guest speakers
- **Target Age Group:** Basic, Intermediate, Advanced
- **Curriculum Areas:** Science, Language, Geography, ICT
- **Safety:** If students are visiting offsite resources then the usual offsite safety rules must apply.
- **Methods Used:** Site Visit, Visiting Expert, Creative Writing

Note

Getting young people to understand human impact on the ocean is difficult if they do not know what oceans contain. This activity will simulate students to “experience” life in the ocean and play out how they think different elements, inhabitants and species interact. Studying the underwater world will make young people realize that it is also important to value things about which they have little knowledge.

Introduction

Some people suggest that we know more about space than we do about our oceans. Certainly many of us may only have contact with the oceans if we live beside them or are lucky enough to go on holiday at the coast. More than 37% of the world’s population lives within 100 kilometers of the coast and this number is rising. The biggest threat for the oceans comes from land: most countries use the oceans as their sewer and 75% of all sea pollution is from land-based human activity.

Process

- ▶ Prepare a visit for your students to an aquarium; there may be one at the local zoo. If that is not possible, maybe you could arrange a class visit from somebody who works with the ocean in some way. There are also good videos available and if the internet is accessible this is another good source. Books and journals such as ‘National Geographic’ give good background information and show fascinating images which can be used in the lessons.
- ▶ Ask the students after the visit or lecture to write down what they have seen, read or heard about life in the oceans.

To Conclude

Link the issues written down by the students to the thematic paragraphs about oceans ecosystems on page 29 of PACHAMAMA. The themes discussed on this page are “Over-fishing”, “Mangroves”, “Coral Reefs” and “Sea Mammals”.

Outputs: Creative Writing Journal for the Class.





Activity 2: *Make an Ocean World*

- **Resources/Materials Needed:** Video camera if available; Chapter on marine and coastal areas in PACHAMAMA (pages 28-33)
- **Target Age Group:** Basic, Intermediate
- **Curriculum areas:** Drama, Science, Geography
- **Safety:** Ensure sufficient clear space for active theatre in your classroom
- **Method Used:** Simulation

Introduction

This activity solicits students to think about a particular element in the ocean and learn how it is connected with other ocean elements. The children will express their interpretations of the issues in PACHAMAMA and all together create a lively Ocean World. Each will play a role in the ocean, but also visit all other elements and inhabitants of the Ocean World that are represented by the other students. All children are both participants and observers of the Ocean World.

Process

- ▶ Let your students imagine that your classroom is underwater. Look at the pictures and the stories in PACHAMAMA (pages 28-31) and invite the students - in pairs or alone - to set up a scene or a mime show of a particular feature of the ocean.
- ▶ Before they start, ask each one what they want to be to avoid duplication. There are plenty of items to choose from - the beach, sea pollution, reduced fish population, manatees, mangrove swamps, dynamite fishing, coral reefs, waves, whales, dolphins, sea turtles, sea weed, small tropical fish, sharks, dolphins, Jacques Cousteau¹ style explorer - and many, many more.
- ▶ When they are set up, become a fish yourself and visit the different elements of the ocean - then take each member of the class, in pairs, around your Ocean World.
- ▶ If there is a video camera available somebody can be asked to record the final sketches so that future classes can see the interpretations of the group of the issues in PACHAMAMA.

To Conclude

If a video is made, you can show the video. Thereafter, discuss in the classroom how the different organisms and activities that took place on the "Ocean World" affected each other. Big sharks preyed on small fish, while fisherman were a threat to fish of any size; coral reefs provided breeding grounds for fish, whereas dynamite fishing destroyed them; seaweed and algae enjoyed the nutritious sewage from people on land, but because of their abundance they were using up all oxygen in the water that fish also needed to stay alive.

Outputs: Video for future classes.

¹ A world famous ocean explorer who made many videos about ocean life.



Oceans



Activity 3: *A Whale in My School Yard*

■ **Resources/Materials Needed:** Large open space; Chalk, Paper, Stones, Leaves etc.; Tape measure or meter rule, Handouts pages 77, 78 and 79

■ **Target Age Group:** Basic, Intermediate, Advanced

■ **Curriculum Areas:** Science, Mathematics, Language, Geography

■ **Method Used:** Imagery, Creativity, Poetry

Introduction

With 75% of the Earth's surface covered with water, oceans are the largest ecosystems on Earth. Within them live some of the smallest life on the planet such as plankton, as well as some of the largest, like whales. All are linked, and they support each other in perfect balance. This activity focuses on whales as an animal that relates to both oceans and polar environments. The reduction of the number of blue whales is an example of the impact humans can have on the environment. The huge size of these animals talks to the imagination of the children and the fact that these enormous animals have only one enemy that brought some of the whale species to the point of extinction shows how powerful the human impact can be.

Blue whales

Whales play an important role in the polar ecosystems and are the largest inhabitants of the oceans. With a length of over 30 meters, the blue whale is the largest animal on Earth. The blue whale is not a fish, but belongs to the group of mammals. These enormous giants in the oceans live in the polar seas which are rich of plankton and krill. In 1900 there were 250,000 whales. However, hunting by humans largely decreased their number. The population of blue whales nowadays totals only 5,000 individuals. In 1994, a sanctuary was created to protect these animals.

Process

On the school playground or a football field, the size of a blue whale can be indicated by the students themselves (see handout page 77):

- ▶ Ask the children to pace out 30 meters; a child stands at each end of this distance;
- ▶ Another child stands 8 meters from one end - the length of the whale's jaws;
- ▶ Five meters on, stand another child - this is one of the whale's flippers.
- ▶ Another 8 meters and you come to the dorsal fin - stand a child there.
- ▶ The final five meters is the broad, flat tail of about seven meters wide.
- ▶ If you are doing this on a concrete surface or black top playground, you can ask the students to draw out the shape of the whale in chalk (the mid-section of the body is about seven meters wide).





Three

If this is not available improvise with paper, stones or leaves to set out the shape of the whale.

► When this is done, invite the children to sit in the middle of the whale and imagine how it must feel to be something that big and alive! Explain what the different parts are and give some background information about blue whales, based on the description above. Imagine the kind of food that would be in its stomach as a lead into the food chain exercise.

To Conclude

The whale and its enormous size can be used as an inspiration for a poetry or creative writing assignment. Back in the classroom, the activity can be continued by explaining how the ocean can support such giants like the blue whales. The handout (pages 78 and 79) shows a large number of species living in the oceans. The students can study the handout and make linkages between the different species, so that they create a food chain (or food web). Ask the students to write creatively from the perspective of one of the species in the food web, e.g. the fish, the whale or plankton. The questions at the end of this module are helpful in focussing the student's attention to the specific characteristics that refer to the diet of different species.

Outputs: Completed food web handouts, poetry or creative writing.

Activity 4: *Turtle Drama*

- **Resources/Materials Needed:** Video camera if available, Handout page 80
- **Target Age Group:** Intermediate
- **Curriculum areas:** Science, Drama, Geography, Art
- **Safety:** Ensure sufficient clear space for active theatre in your classroom
- **Method Used:** Drama Based on a story from PACHAMAMA

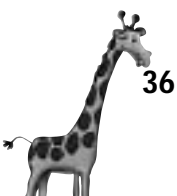
Introduction

All too often we hear or read about stories of animals and plants being affected by pollution from human activity. We hear of ocean creatures suffering diseases due to sea pollution or levels of fishing that make some fish almost disappear. This activity familiarizes the students with environmental problems affecting the oceans and encourages them to offer solutions. The activity described here is entirely based on the Turtle Story in PACHAMAMA on pages 32-33.

Process

The turtle story is painful: you will have to be the judge of whether your students are sufficiently mature to undertake this activity as you do not want to upset younger, more sensitive children unnecessarily.

► Start by telling the students that they are going to stage the Turtle Drama - point out or get the group to select the reader and the main actor.



Oceans



▶ Everyone else in the class takes one of the other characters - one is playing the friend, others being the spear-throwing humans, the fish-hooking humans, the construction machinery etc. The turtle drama handout provides an overview of the different roles.

▶ Invite the reader to sit at the front of the class and to read pages 32 and 33 of PACHAMAMA as the actors play the story – the turtle crawls through the class room, the whole class is throwing spears at her, hooking her and poking her on a fishing boat, then throwing her back in the water, and digging up the beach where her eggs lie.

To Conclude

After the performance, discuss with the students what will happen if the story is repeated over and over. Ask the students if they can think of other situations where human activities largely interfere with the lives of plants and animals. Examples are the story of destruction of the rainforest, or over-fishing the seas. Why are we exploiting nature in such a way? Explain that oceans are often thought of as infinite sources of fish; that we feel they are so large that pollution will be diluted without having any impact on sea life. However, nowadays we are becoming aware of the environmental problems and we therefore need to change our practices. Encourage the students to act out the drama again, with suggestions on what we can do to solve these environmental problems. See how the turtle's path turns out differently. The drama can also be presented to other classes or the whole school during an assembly or filmed if a video camera is available.

Outputs: Assembly or video of the Turtle Story.

Activity 5: *Polar Regions* *A Guided Fantasy*

- **Resources/Materials Needed:** Paper, Pens, Pencils
- **Target Age groups:** Advanced
- **Curriculum Areas:** Geography, Language, Science
- **Method Used:** Simulation, Fantasy

Introduction

Very few of us will ever visit a polar region. Perhaps some of us think of the regions as vast, bland, empty, white and boring; others as a beautiful ice-cold paradise. This activity will introduce students to the polar regions and stimulate students to use their fantasy.

Process

You can set up your classroom as a polar region in the same way that you set it up as an Ocean World (Activity 2 of this module). There are plenty of elements - polar bears, arctic foxes, Siberian forests, the hole in the ozone layer, whales, pollutants, etc.





Three

However, you may find it more productive to give your students a guided fantasy to the polar regions:

- ▶ Ask a student to read the first two sentences between quotation marks on page 58 of PACHAMAMA, in which Antarctica is described as the 'only peaceful region of the world'.
- ▶ Then ask the students to sit back, close their eyes and listen.
- ▶ Read the Guided Fantasy in the box below to the children.

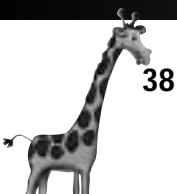
Note

The Fantasy Story may not be easy for many rural schools or the youngest children. To make it easier to understand the story you could start with a brainstorming session about how the polar regions look like.

A Fantasy Journey to the Polar Areas

Make yourself as comfortable as possible ... relax ... take your mind off any worries or concerns that might be bothering you ... block out any noises that might be going on outside the room ... and begin to breathe in and out in a steady fashion ... breathe in to the count of 1.. 2.. 3 and out to the count of 1.. 2.. 3, in 1.. 2.. 3 and out 1.. 2.. 3 ... now make your mind blank ... fill it with a warm, soft darkness ... and relax ... slowly you become conscious of a gentle movement ... you are in a spacecraft exploring outer space ... you see Planet Earth in the distance ... from far away all you can see is the blue of the ocean and white of the clouds ... your craft is gently and quietly moving towards the surface of the planet ... it is a living and breathing planet, inhabited by all kinds of creatures and wildlife ... but while you can see those who live there, they cannot see you ... your spacecraft is 'cloaked' with invisibility.

As you circle around the planet your eye is caught by two large white spots... Your curiosity makes you decide to have a closer look at one of these spots ... Your spacecraft sinks closer to the surface ... the light becomes brighter and brighter and you feel as if you are in an enormous hall of light...Then you hear nothing ... only silence ... apart from the soft zooming of your spacecraft ... The world is perfectly white ... Far below you, you see an animal that looks like a white bear lumbering, jumping from ice flow to ice flow ... Behind a rock a little arctic fox is trotting across the wilderness ... its tail held high as it jumps into the air ...Then you see through the enormous observation window of the spacecraft signs of human settlement ... must be the homes of the inhabitants ... some of them look similar to your own house, others are white and appear to be made of the same material that cover the rest of the area ... out of this big blanket of snow ... these people obviously have a special way of living ... then you see a group of inhabitants ... the people are fishing, but as you come closer and pass the windows of the warm houses you see a computer screen on one of the desks ... then you begin to flow over a vast white area ... as far as you can



Oceans



see the world is white ... for kilometers there is nothing you can see except white ... the spaceship alters its direction and you are now in the higher layers of the atmosphere ...beep-beep-beep...the chemical sensor warns you of poisonous substances in the air ... you send the sensor to do a time scan ... and the results are strange ... for a long time in its history this section of air was clean and healthy ... then in a very brief period of time these poisons suddenly appeared ... almost as if they had been dumped there ... you ask the sensor to identify the polluting substance and to chart the layer in which you fly ... the sensor shows clear pink spots in the layer and a metallic voice explains that these substances are the so-called CFCs, man-made products that destroy the ozone layer ... is disappointing and worrying ... but you move on ... and then you fly over mountains and hills of ice ... you see many small streams coming together to form a large, majestic river ... you follow this river and see how it ends in a bay with huge blocks of ice ... as the river gets closer to its mouth factories appear along its banks ... buildings that resemble oil refineries are common ... and you are impressed by the level of development in the snow... however, the chemical sensor display warns of the presence of oil in the sea ... your computer breaks into the computer of a large research center ... the records show high rates of oil spillage from tankers and from pipes on land ... more disappointing and more worrying ...

Your craft moves on ... across a sea and over another area of these white plains ... once again you are flying over a rural area ... and you see a village ... but the farms are neglected ... and it seems that the village is completely empty of life ... 'ghost towns' ... why? ... the chemical sensor display registers high levels of ultraviolet radiation and of pollution in the air ... the pollution seems to come from far ... transported by wind and water ... your screen shows a message: village abandoned because of levels of pollution and radiation ...you fly further ... over another sea ... and below you is a cargo vessel ... sailing peacefully ... you fly lower ... trying to regain your composure ... the sea is calm and blue ... the sun is setting on the horizon ... beautiful ... and then your display sensor begins to scream at you ... the ship is transporting loads of fish under which very, very big ones are trapped ... You ask for another time scan ... your computer breaks into the historical records and ... these fish are being exported in such large quantities that the ocean is on its way to becoming empty! ... you begin a memo to your computer log ... 'These inhabitants appear to want to kill themselves and their planet' ... but you cannot finish it ... because of an enormous "CRACK" ... a block of ice as big as an island falls from the icecap into the water ... the whole spacecraft is shaking and tumbling ... "Hey, what is that" you shout ... you watch as a big wave washes away the small village below you ... you realize that the ice is melting ... it is difficult to stay calm ... you send your computer on a search ... and it uncovers a scientific report that predicts a rise of the sea level up to one meter in the future due to global warming and melting of icecaps ... It is clear the ice caps are already melting ... the sea level is already rising ... you have seen it with your own eyes ... the spacecraft gathers speed ... and moves off into outer space ... back towards your home ... but the images remain in your head ... what are you going to do about what you saw? ... the warm, soft darkness fills your mind again ... relax ... relax ...

When you are ready ... come out of your fantasy journey ... and become conscious again of your surroundings ...



To Conclude

After the Guided Fantasy, read with the students pages 58 and 59 of PACHAMAMA. These pages contain a lot of information about the polar areas and their environment. Ask the students to imagine they are a polar bear or an Inuit and to write a letter or make a drawing describing what it is like now to live at the Poles.

Outputs: Letters or drawings describing what it is like now to live in the polar regions

Questions for Module 3

Use PACHAMAMA pages 28-31 to answer these questions:

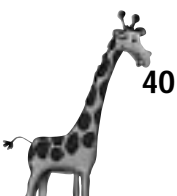
1. Look at the picture in PACHAMAMA on pages 28-29. What kind of animals do you recognize?
2. The blue whale does not have teeth. Do you know how the blue whale eats? (page 59)
3. Orcas and sperm whales belong to the tooth-whales. What do you think they eat?
4. What can we do to protect whales?
5. What could be changed to make fishing more sustainable?
6. Homework Assignment: The future of whaling

The children will probably rebel naturally against slaughter of whales. Ask them to investigate why whale hunting takes place and what the current situation regarding whale hunting is. They can reflect their findings in a letter directed to you, a newspaper, Greenpeace or a government. Explain that a good investigation takes all points of view into account: the views of the inhabitants, the hunters, the researchers, the environmental view, etc. The Vanishing Act (page 30) and other sources quoted in PACHAMAMA can be helpful for this purpose. Ask the students to read out their letters to the class and invite them to judge which is the most effective. What arguments are used in the various letters?

7. Why do you think the icecap is melting in Activity 5?

Solutions

1. Shark, sea-horse, coral fish, dolphins
2. The blue whale filters very tiny organisms that live in the polar seas from the water: krill, plankton.
3. Fish and octopuses. Orcas also eat seals, penguins and even land animals that come near to the coast.
4. International agreements to stop killing whales.
5. Stop dynamite fishing and limit the number of fish that fishing fleets may take. Use nets with bigger holes so young fish can escape.
6. Important arguments are:
 - economic value of whaling
 - research value of (destructive) whale research
 - traditional (fishing) practices
 - population becomes too small, risk of extinction
 - destabilizing ecosystems by removing a big player in the food web
7. Global warming





Teaching Module 4: *Forests and Biodiversity*

Rationale

The subject areas “Forests” and “Biodiversity” are strongly related as forests form the habitats of much of the world’s biodiversity. Large areas of the Earth’s surface were once covered with trees. However, the development of human settlements and agriculture has been destroying the world’s forests. Land is needed for the production of food and the building of villages, cities and roads. Moreover, forests are an important source of building materials and firewood. PACHAMAMA states that the world has lost 80% of its original forests. This has not been without consequences for the state of our environment. As this module will explain, this is particularly important when considering that deforestation contributes to erosion and desertification, climate change, poverty and loss of beauty.

PACHAMAMA highlights various aspects of forests and biodiversity, from forest fires to the introduction of exotic species. This module starts with an introduction to tropical rainforests and an explanation of the role of forests on Earth. After this Teaching Module it is envisioned the children will be able to understand the significance of forests, the key environmental concept of “biodiversity” and some of the related terms.

Module 4 Aims at

- Enhancing the students’ understanding of the richness of life in forests;
- Gradually introducing students to the concept of biodiversity;
- Encouraging students to think critically about the reasons for deforestation and biodiversity loss;
- Encouraging students to come up with possible solutions to counter environmental degradation.





Objectives

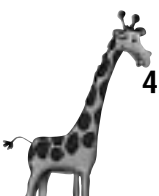
- To experience the rainforest (virtual) and understand the meaning of biodiversity
- To establish respect for trees and to understand the importance of forest for life on this planet
- To improve skills like careful reading and building an argument
- To analyze the ways in which human beings affect forests and biodiversity and the measures that can be taken to preserve forests and the biodiversity on Earth
- To understand and apply key terms like extinction, habitat, exotic species and genes
- To understand and apply knowledge from success stories in countering the major threats to forests and biodiversity

Teaching Module 4 relates to the 12 pages on Forest and Biodiversity in PACHAMAMA (pages 40-52). The table below indicates the activities for this module, title and key content of the topics. It also provides guidance on the target group for the different activities of the module and indicates the relevant sections in PACHAMAMA.

Activity no.	Title	Key content topics	Target age group	PACHAMAMA
1.	Picturing Tropical Rainforests	Rainforests	Basic, Intermediate, Advanced	P. 43
2.	Causes and Effects of Deforestation	Causal relations Forest preservation	Intermediate Advanced	P. 40-45
3.	Understanding Biodiversity	Keywords	Basic, Intermediate	P. 46-49
4.	The Council of All Living Things	Habitat change	Basic, Intermediate,	P. 46-49
5.	Examining the Map	Exotic species	Basic, Intermediate, Advanced	P. 40-41 P. 50-51
6.	Local Biodiversity	Identification of species	Intermediate, Advanced	P. 47

Lists of resources provided

Activity 6: List to describe the characteristics of a plant or tree - Handout page 81



Biodiversity



Activity 1: *Picturing Tropical Rainforests*

- Resources/Materials Needed: Notebooks, Pens
- Target Age Group: Basic, Intermediate, Advanced
- Curriculum areas: Drama, Geography, Science
- Method Used: Poetry Reading and Interpretation

Introduction

When we hear about tropical rainforest destruction, we are talking about some of the only remaining large areas of forest left. Before going into detail about the function of forests, this activity aims at creating a feeling for what tropical rainforests are. The poem included in PACHAMAMA on page 43 gives a lovely impression of forests.

Process

We suggest you start this module by taking time to read the poem on page 43 of PACHAMAMA with the class using the following guidelines. Discuss the poem with the students afterwards.

- ▶ Invite a student to read the poem "Silence" on page 43 of PACHAMAMA to the class.
- ▶ Why does the tree in the rainforest "crash soundlessly"? What is the intent of the poet in saying this?
- ▶ What is the "gossamer curtain"? What is it a symbol of?
- ▶ How does the Earth "claim" an old tree?
- ▶ Ask the students to write poems expressing their feelings or to draw the life in a forest.

To Conclude

Many good videos are made of tropical rainforests. If you have access to these you can continue the module by showing one of these to the students. If a video is not available, there are many fascinating pictures in such magazines as the National Geographic.

Output: Poems or drawing about forest.





Activity 2: *Causes and Effects of Deforestation*

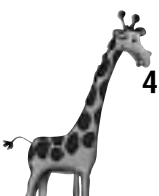
- **Resources/Materials Needed:** Copies of PACHAMAMA pages 40-45; Red and blue pens
- **Target Age Group:** Intermediate, Advanced
- **Curriculum areas:** Language, Geography, Science
- **Method Used:** Group Work, Presentation, Letter Writing

Introduction

The rate of deforestation (loss of forest), is about 375 km² a day. That is comparable to the clearance of one football field every second! Causes of deforestation are mentioned in several places in PACHAMAMA. This activity invites students to search in the text of PACHAMAMA for causes and effects of deforestation. In addition, it encourages the students to become involved in important environmental issues and turn their learning into action.

Process

- ▶ Divide the class into six groups of students.
- ▶ Each group gets a copy of one page from PACHAMAMA: page 40, page 41, page 42, page 43, page 44 and page 45.
- ▶ Ask the students to underline the causes of deforestation with red, and the effects of deforestation in blue.
- ▶ One student per group will prepare a short presentation to the whole group about their findings.
- ▶ Make sure that each presentation starts with the title of the page, poem or case; the main subject of the text as well as the causes and effects found in the text must be included in the talk.
- ▶ The students can now compare the findings of each group. Are the causes and effects the same in different parts of the world?
- ▶ Make a list of solutions that can address the problem of deforestation forest found in the texts on the blackboard and discuss it in the class.
- ▶ Ask the students to write a letter to a government in which they ask for the preservation of forests. The arguments discussed should be reflected in their letter. The letter can be structured by answering the following questions:
 - What causes deforestation?
 - Why is deforestation a problem?
 - What solution do you propose?



Biodiversity



To Conclude

Read out the letters in the classroom and have students decide which letter is most persuasive. Explain to the students that by building up an argument, the person you address in your letter is better able to understand your point of view, why you wrote the letter, and therefore (hopefully) will be more prepared to listen to you.

Outputs: Letters about the issue of deforestation.

Activity 3: *Understanding Biodiversity*

- **Resources/Materials Needed:** Nature magazines, Newspapers, Art materials
- **Target Age Group:** Basic, Intermediate
- **Curriculum areas:** Science, Geography, Drama, Art
- **Safety:** Ensure a clear space for the students to express themselves safely in the classroom
- **Method Used:** Simulation, Visualization

Introduction

It is hard for us to begin to understand the colossal variety of plants and animals with which we share this planet! There may be as many as 12.5 million of them, but, to date, we have counted no more than 1.75 million species on the world. With the decline of forests we are also losing the species living in these ecosystems. Species might become extinct before we discover them. As each organism plays a specific role in any ecosystem, we are not only losing species, but also their function in the web of life. This activity is designed to familiarize students with key environmental concepts and discuss the causes of extinction.

Process

- ▶ Read through the "Biodiversity" section on pages 46-47 of PACHAMAMA.
- ▶ Invite students to choose an animal. They can also choose an extinct species.
- ▶ Go around the class and ask each child to say out loud the name of their chosen animal and to act how it moves and sounds. What is the animal doing the whole day? What is its function? How does it interact with other species?
- ▶ After all animals are introduced, tell the students that this is one meaning of 'BIODIVERSITY': the variety of plants and animals that exist in nature.





▶ Tell them that all the wonderful things they have named are part of the variety of life on our planet, except for some: ask the dinosaurs and dodos to please go and stand in a corner. Explain that they are not here because they have all died out. They are 'EXTINCT'!...

▶ Continue by naming some of the other animals that are at risk of extinction - tigers, rhinoceros, gorillas etc. Ask them to stand in another corner.

▶ Then put the other wild animals at risk from human activity such as deforestation, polluting oceans and freshwater, etc. in a corner, until you have only human beings and domestic animals - cows, chickens, dogs, cats - standing in the centre of the room.

▶ Try to find out about the animals in danger of extinction. Ask the students why they think some extinct species disappeared. This might have been because of human causes or natural causes. Explain that we call the natural home of a plant or animal the "HABITAT" of the species.

▶ Turn to pages 48 and 49 of PACHAMAMA and read the sections entitled "Dodos", "Airmail" and "Stealing Fruit?".

▶ Discuss how we can protect species from extinction (by preventing over-exploitation and preserving habitats).

▶ Ask the students to draw an endangered species in its habitat and hang the results on the wall in the form of a large collage of drawings. Provide some (local) nature magazines, if these are available, so that children can search for endangered species in their own region.

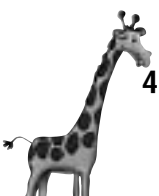
To Conclude

After this activity the students will know the meaning of "biodiversity", "habitat" and "extinction", and have some idea of animals that are threatened with extinction and why.

Outputs: Wall display of endangered animals.

Note

Instead of asking the students to create a wall display you can also go straight to Activity 5 of this Teaching Module.



Biodiversity



Activity 4: *The Council of All Living Things*

- **Resources/Materials Needed:** Art material for masks: Paints, Cardboard, Bits of string or elastic, or sticks so that the masks can be held in the hand
- **Target Age Group:** Basic, Intermediate
- **Curriculum areas:** Geography, Language, Science, Drama
- **Method Used:** Role Playing, Fantasy, Debates

Introduction

Animal Farm is perhaps the most famous fantasy story of animals taking over the world. This activity is a useful exercise to stand back and imagine how the world would be if animals ruled the world in their interests. It would be a very different world. The activity aims at shifting the perspective of the students through role-play and encouraging them to find solutions. Each student will represent an animal. The animals are having a gathering to discuss the environmental problems in their environments, like government officials do in a council. At the end they will come up with certain resolutions and vote upon them. There are many different versions of this idea - and it is a great one! Try it out, especially after they have done the "Understanding Biodiversity" (Activity 3).

Process

- ◆ Explain to the students what a council is and that they are going to form one of all living things in this activity.
- ◆ The students can retain their chosen animal in Activity 3 in the Council. Tell them they can choose a new animal or a plant if they wish.
- ◆ Ask students to pause and take a moment to reflect on what it might really be like to be that animal or plant - a lark singing as it rises in the morning sky, a flower waving in the breeze, a tiger hunting or an antelope being hunted, or a snake sunning itself on a quiet rock...
- ◆ Invite students to make simple masks to give a face to the animal, or plant, that they represent. Provide the children with material so that they can create masks.
- ◆ To make the children more comfortable in their roles, you can ask them some questions about their habitat and life as a particular plant or animal.
- ◆ The students should elect one of them to chair, control and facilitate the meeting and one member to be the clerk to make notes and write down the resolutions (proposals for agreement).
- ◆ Invite the students to sit in a circle and discuss the problems that are mentioned in PACHAMAMA: pollution; destruction of the rainforests; exotic species; growing numbers of human beings and their





impact on Council members' lives. Write these points for discussion on a black board or a flip-chart.

- ▶ Ask each student to stand up and make a statement on behalf of her or his species.
- ▶ Encourage the other animals to applaud - or say "Hooray! Hooray!"- as people do in some real council meetings.
- ▶ Let the debate last up to a maximum of an hour, or until you feel all the points have been made.
- ▶ By the end, ask the members to make a series of 'Resolutions' that the Council can vote upon.
- ▶ Explain that whoever proposes a resolution has to make a final defense of it, and then take a vote.
- ▶ The clerk summarizes which resolutions are accepted by the Council and the chair closes the meeting by thanking all the members for their contributions.

To Conclude

Discuss with your class how the world would be run differently if animals and plants had a voice and could influence policy and resolutions. Note down carefully the text of each resolution and the results of each vote. The students can publish them in the school magazine, or maybe send them to a local newspaper.

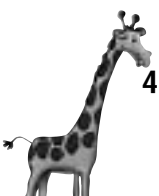
Outputs: Resolutions about how the students feel about protecting the natural world.

Activity 5: *Examining the Map*

- **Resources/Materials Needed:** Atlas or maps; Art materials
- **Target Age Group:** Intermediate, Advanced
- **Curriculum areas:** Science, Geography, Art
- **Method Used:** Instruction, Map Reading

Introduction

Today many people and goods travel from one part of the world to another: flowers come from Kenya or Columbia, cocoa from Brazil, fabric from India and people travel all over the world for business and vacations. In the past, a number of plants and animals have also traveled from one part of the world to another. Not because of the wind or currents in the oceans, but because humans imported them. Nowadays, we know that introduced species can pose a risk for native plants and animals. On PACHAMAMA page 48, we already looked at the example of the extinction of the Dodo due to the invasion of European settlers into Mauritius. In this activity we give some more examples of the impact of exotic species, with the help of PACHAMAMA, and explain what the consequences were of species introductions into areas where they never occurred before.



Biodiversity



Process

Ask the class to look at the map on pages 40-41 of PACHAMAMA or a wall map if you have one. You can use the map to show where the remaining old-growth forests are found (the Amazon rainforest, Central Africa, South-East Asia, Canada and the Russian Federation) and to explain what the term 'exotic species' means. To prepare, please, have a look at page 40 of the forest section and "A Sugary Story" and "Stop that Plant" on pages 50 and 51.

◆ Show where the remaining old-growth forests are found: the Amazon rainforest, Central Africa, South-East Asia, Canada and the Russian Federation. See how very little rainforest there is left. But remind the children that there are huge temperate forests covering much of Russia and North America.

◆ Show how the cane toad came from the swamplands of Central and South America to Australia.

◆ Explain why: because the sugarcane production was threatened by sugarcane beetles. As none of the insecticides the farmers tried worked, they introduced this beetle-eating toad.

◆ Show how the toad is now spreading over North Australia. Explain that none of the animals that normally eat cane toads live in Australia, so their numbers have increased hugely. After the beetles were wiped out by the toads, the toads went looking for other food and became a great risk to native insects, fish, amphibians, ground-nesting birds and even small mammals.

◆ Also, show the route of the water hyacinth from Brazil to Uganda and the zebra mussel from Europe to North America. Such movements are in most cases not natural - human beings introduced species in ecosystems where they did not belong.

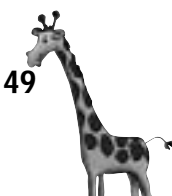
◆ Explain that the intentions of doing so were honourable and sometimes successful. The cane toad did solve the problem with the sugar cane beetle. Another example is the positive effect the introduction of the myxomatosis virus had in controlling the population of rabbits in Australia that had been destroying much of the vegetation.

◆ However, history has taught us other lessons as well, and the cane toad and water hyacinth pose difficult problems in the areas where they are introduced. Explain that we had limited ecological knowledge at the time we deliberately introduced species into new environments.

To Conclude

Tell the students that the species you talked about were examples of exotic species: animals or plants introduced to new environments different from where they originated. These may be dangerous to native species. Conclude this activity with reading "Stop that Plant" on page 51 of PACHAMAMA. It is not completely clear how the water hyacinth ended up in Africa. However, it is greatly disrupting the ecosystem, and the lives of people living near Lake Victoria. Point out that the possible solution suggested by the author is the introduction of a beetle. Does this remind the students of another story...?

Outputs: Map showing the movement of some species around the world.





Activity 6: *Local Biodiversity*

- **Resources/Materials Needed:** Pencils, Notebooks, Magnifiers, Plant identification table, Handout page 81
- **Target Age Group:** Intermediate, Advanced
- **Curriculum areas:** Science, Geography, Art, ICT
- **Method Used:** Pairing, Outdoor Work, Drawing
- **Safety:** If the students handle the plants then they must wash their hand afterwards

Note

If there are no plant identification tables available you can perhaps ask the assistance of somebody with good botanical knowledge of local plants and trees (a gardener or a biologist).

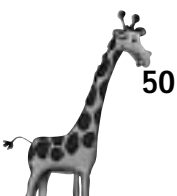
Introduction

The unfortunate thing about tropical rainforest destruction is that we are destroying plants and animals that we have not even discovered yet. These plants and animals may be able to help us in medicine to find cures for diseases we suffer - just like many rainforest products do already. Being able to identify the variety of things or "species" in nature is very important to understand the real value of PACHAMAMA. A very useful resource for your school would be a file made up of careful drawings, brief descriptions and details like size, time of flowering, place where you found it etc. of all the plants on your school grounds. This activity allows the students to contribute to such a file. However, identification of species is a difficult job. For this activity plant identification tables are required or the assistance of somebody with good botanical knowledge.

Process

How often have you seen a small plant and thought, "I wonder what that is called"? When you try to find it in a plant book there are so many that look the same it can often be confusing.

- ▶ Explain the aim of the activity to the students, which is, to create a file made up of careful drawings, brief descriptions and details like size, time of flowering, location etc. of the plants and trees on your school grounds. If you identify trees, their fruits and blossoms need to be described too. Just like one of the books we find in our libraries but specific to your immediate area.
- ▶ The students will work in pairs. Explain the procedures below before going outside.
- ▶ Go to the school grounds with pencils, papers, magnifiers and the handout for Activity 6 (page 81).
- ▶ Each pair of students chooses a plant or tree to identify.



Biodiversity



◆ Invite the students to make a drawing and describe the characteristics of the plant or tree. Use the handouts provided for this.

◆ Encourage the students to consult the plant identification table or ask the botanical expert for assistance with identifying the plant.

◆ Once the plant species or its family name is identified, invite the students to write down their results in a table and to finalize their drawings.

To Conclude

This is an activity that will take time and could be turned into a year long project if you want to illustrate the plants yearly cycle, but it will build up to be an extremely useful (identification) resource for future activities. If computers are available, you can also teach the students how to make a spreadsheet to store their findings. Explain that by keeping such records, in time scientists will know what happens to the species in a particular region. If they prove that the number of species is altered, this can be significant information for policy makers to protect an area (for example by making a nature park).

Outputs: Field classification resource for local plants and trees.

Questions for Module 4

1. Do you know why plants need carbon dioxide?
2. What does it mean if animals have no predator? To answer this question read the PACHAMAMA story about "Dodos" on page 48 and "A Sugary Story" on page 50.
3. In island states like Hawaii, the immigration officials do not allow you to bring in even an apple from another country. Could you explain why this is the case?

Solutions

1. The carbon in carbon dioxide is used for plant growth: it becomes the wood and leaves of a tree.
2. It means that these animals do not have enemies that hunt them. Therefore it sometimes means that they do not need to defend themselves much. This was the case for the Dodo. But once predators were introduced into the habitat of the Dodo the bird had no protection and soon disappeared. It can also mean that the animal can really spread, like in the case of the cane toad. In Australia, the animals that usually ate the toads were missing, so the number of toads increased rapidly and they started to spread all over Northern Australia
3. This is because they are afraid that it might contain a foreign bug that would threaten the native island species.



Teaching Module 5: *Urbanisation and Land Use*

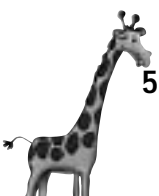
Rationale

This module deals with the subject areas of “Land Use” and “Urbanisation” both as separate and connected issues.

Both in rural and urban environments, humans are placing high levels of stress on the land. The rural-to-urban migration of the last hundred years has intensified the environmental problems facing cities. Urban environments are plagued by problems like water shortages and polluted water, insufficient sanitation, and rising rates of air pollution, all of which can lead to severe health problems. As the populations of cities continue to rise (presently, almost half of the world’s total population live in cities), the area needed to house urban settlers expands and stretches out into farmland and other areas. In the rural areas fertile soil is lost to land degradation and desertification, which strip away the crucial topsoil needed for food production. The degradation of soil, due to pollution, deforestation, overuse of fertilizers, and urban expansion, leads to serious threats to global food security.

Module 5 Aims at

- Explaining the crucial role soil plays in the production of crops and food security;
- Exposing students to the causes of land degradation and desertification;
- Discussing the impact growing cities have on land and food;
- Enabling students to address the issue of waste in their local environment, and take an action-oriented approach to the problem.



Urban & Land



Objectives

- To introduce students to key terms like 'desertification', 'land degradation', 'food security' and 'urbanisation'
- To develop a high regard for the soil and sensitize students to the threats we pose to it, and what we can do to conserve it
- To identify root causes of urbanisation and the major impacts of cities on the environment
- To understand and analyze the problems posed by waste and garbage in our cities

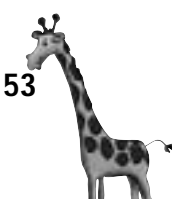
Once the students have an understanding of what soil is and its importance, the activities then alert them to the stresses that humans place on the earth. These can then be related to urbanisation and issues of waste and its management.

The table below indicates the activities for this module, the title and key content of the topics. It also provides guidance on the target group for the different activities of the module and indicates the sections in PACHAMAMA that the activities relate to, to assist you in your teaching of the subjects.

Activity no.	Title	Key content topics	Target age group	PACHAMAMA
1.	Understanding Soil and Soil Degradation	Function of soil; introduction of key terms	Basic, Intermediate, Advanced	P. 36-39
2.	Urbanisation	Root causes of urban migration	Intermediate, Advanced	P. 54-55
3.	Taming the Garbage Monster	Awareness of waste generation and management	Basic, Intermediate	P. 56-57

Activity 1: *Understanding Soil and Soil Degradation*

- **Resources/Materials Needed:** Clumps of earth (a variety of samples to reflect local conditions), Hand lenses, Magnifiers or microscopes, Accurate weighing scale, Bunsen burner, Crucible
- **Target Age Group:** Basic, Intermediate, Advanced
- **Curriculum areas:** Science, Geography, Art
- **Method Used:** Outdoor Activity, Observation
- **Safety:** When dealing with soil, students should always thoroughly wash their hands after the session. If heating soil samples, usual laboratory safety rules should be observed





Introduction

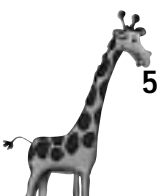
Maybe we call our planet the “Earth” to acknowledge the importance of the top 20 cm of our land: the layer we call ‘earth’, ‘soil’, ‘mud’, ‘topsoil’ or just plain ‘dirt’. Understanding the importance of preserving this valuable resource is a vital step towards understanding the needs of PACHAMAMA - Mother Earth.

Topsoil is, after water, maybe the most valuable resource on the planet. Everything grows out of it - and yet we are throwing it away recklessly: 40 thousand million tonnes of topsoil has been wasted in the last 20 years - equivalent to all the topsoil in India! That is as if 400 10-ton dumper trucks lined up along the top of a cliff emptying a load of soil every minute of every day and night, of every year for twenty years. It is a real waste - and without the fertile topsoil, we cannot have food.

This exercise is designed to generate familiarity with local soil types, the process of soil degradation, and the role soil plays in food development.

Process

- ▶ Go out to several places in your local environment and dig up some earth from different spots.
- ▶ Divide the samples. Take half of the samples and place them on a metal tray, or dinner plate, in the hottest part of your school (in the sun or on a heater) to simulate a hot climate. After some time it will completely dry out. In the meantime, bring the other half of the samples into the classroom for observation.
- ▶ Let each student feel it and look at the grass roots growing down into it. This will allow students to recognize how the soil is used to anchor vegetation. Tell the students that most of their food relies directly, or indirectly, on the substance they are looking at. Soil contains the nutrients that allow vegetation to grow, which humans eat directly, or indirectly through animals that feed off plants. Explain to the students what topsoil is.
- ▶ People need enough food in order to live. That is called “food security”: having access to enough food. Ask the students why people in some regions of the world do not have enough food. How is this connected to soil?
- ▶ Explain to them that food security has to do with both food production and the availability of food (distribution). Then ask a student to read the paragraph on Food Security on page 35 of PACHAMAMA. How do issues of urbanisation, debt and poverty, and large populations affect food security and soil?
- ▶ Place the students in pairs and provide them with a sample of soil. Ask them to examine the soil very carefully (note that there could be a variety of soil types in your locality). Use hand lenses or magnifying glasses if available. Ask each pair to make a list of the things they find in the soil. If they do not know what it is they can also make a drawing of it. For further experimentation, see the science section below.
- ▶ Bring the baked earth from your hot spot to the classroom. The earth will be dry and it will crum-



Urban & Land



ble in your fingers. You will find less insects in the dried soil as most of the organisms in the soil need a moist environment.

▶ You can show the students how a part of the topsoil is lost by blowing some dust off the tray or plate. Discuss other causes of soil degradation: soil loss by water erosion, overgrazing, soil depletion by growing particular crops for a long time on the same piece of land, and contamination of soils by chemicals are good examples.

▶ Show the students a map and ask them to identify where Niger is – this is right in the middle of the Sahara Desert.

▶ Ask the students what they think a desert is. Read the story “Hope in the Sahara” (page 36 of PACHAMAMA). How does a desert grow? What is ‘drought’, ‘desertification’, ‘land degradation’ and how do they impact on food security and jobs?

For Science Classes:

The following activity can follow the one above, as it is closely related. It takes the observations further by exploring other aspects of soil composition.

▶ Let the students test to see if and how much clay is in the soil by trying to roll a small sample in the palm of the hand into a worm.

▶ If you have access to accurate balances, you can assess the content of water and organic matter in the soil in front of the class:

- Take a sample of fresh soil and weigh it;
- Heat the soil sample so that all the dead things like roots, seeds, insects etc are burnt off;
- Weigh the sample again once it has cooled. The difference in the weight gives an indication of the organic matter content. You have also removed the water unless you start with 100°C heated soil.
- You can present this as a percentage by dividing the difference in weight by the original weight of the sample times 100%. Repeat the experiment with different soil types for a comparison.

Note

The students will most likely also find other plant material, insects and nematodes (tiny worms), or their eggs. These insects play an important role in the top soil: they break down organic material like leaves into small pieces so that the soil can more easily compost the dead material of plants and animals. Perhaps there are also seeds in the samples. You can tell the students that seeds sometimes stay for a long time in the soil and only start to germinate when the conditions in the soil are favourable for a new young plant, for example if the soil is moist enough.





To Conclude

Discuss with the class their observations of the different soil types and the differences between the wet and dry soil. The soil type is an important factor for the kind of vegetation (plants and trees) you will find in an area. Ask the student what they think a healthy soil should consist of (or not have).

End the activity by reading the story of "Tom the Survivor" on page 38 of PACHAMAMA. The story illustrates very well how important the topsoil is and what the future will look like without proper land management. Ask the students to write down what they believe would be a sensible way to treat soil so that future generations can farm the land too. The students can present their solutions to a land expert like a farmer. Invite this expert to talk afterwards about the way land use takes place in your country and the kind of problems people face due to land degradation - for example, crop losses, incidence of (parasitic) weeds and difficult cultivation - but also what type of measures government, farmers, forest councils and so on take to combat land degradation. Ask the students to make notes and write about soil protection in their own words.

You can also consider starting with the school's own compost heap, where organic waste such as old fruits, remains of maize cobs and kitchen waste (if the school has a kitchen) can be recycled. You can use the compost to enrich your own soil on the school ground, or supply the community vegetable patch for example.

Outputs: Pieces of writing on ways to treat soil as a valuable resource; Organic recycling system producing nutrient rich compost (optional).

Activity 2: *Urbanisation*

■ **Resources/Materials Needed:** Art materials; Magazines, Photos of rural areas; A4 Paper; Green and red napkins

■ **Target Age Group:** Intermediate, Advanced

■ **Curriculum areas:** Geography, Science, ICT, Mathematics, PSHE, Citizenship, Language

■ **Method Used:** Participatory, Lecture

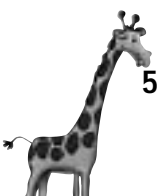
Note

Instead of red and green napkins you can use pieces of cloth or paper or anything else to indicate rural / urban. Teachers have for instance used leaves of different type and colour.

Introduction

People move to urban areas for a number of reasons, for example:

- to find work;
- for education (especially tertiary courses);
- to find 'better' living conditions, such as housing, electricity, clean water and sanitation;
- to escape conflict in rural areas;
- to have better access to health facilities;
- to join family members.



Urban & Land



Towns are a convenient way of accommodating large numbers of people. But what is the effect of this on the environment?

Process

- ◆ Explain to your students the difference between 'urban' and 'rural' environments. Write the two words up on the board - and explain: rural = in the countryside; urban = in town. Discuss how the two groups make different demands and have a different impact on their environment.
- ◆ Set up each student's desk as a family: explain how 200 years ago in Europe and North America, 90% of families lived in the countryside. Pass out green napkins and place them on 90% of the desks and red napkins on the other 10%.
- ◆ Then explain that now, more than 50% of families live in towns: remove 40% of the green napkins and replace them with red ones.
- ◆ The classroom is now looking very different - so ask the children what they feel the consequences of this change are?
- ◆ Explain that 'urbanisation' means the concentration of people and activities in the cities of a country. Urbanisation is a process where cities grow, partly because people move from the rural areas to cities.
- ◆ Finally, ask the students: Why do people want to move into towns? What are the consequences for the environment, for land, air, water and health? Turn to pages 52-53 in PACHAMAMA for an overview of urban issues.
- ◆ After reading PACHAMAMA ask the students how the rural to urban migration impacts on farming communities. What does the rise in urbanisation mean for food security?

Note

If data about urbanisation in your local area are available, the exercise with the napkins can be repeated or replaced by the actual numbers that apply to your country or region.

To Conclude

Ask the students to think about all the positive reasons for staying in the rural areas. They should imagine that they work for an advertising agency and have been recruited by the local authority to produce a brochure or leaflet promoting to people to either stay in or move to rural areas. By folding a sheet of A4 paper into 3 this produces a 6-sided leaflet. What attractive things can the local authority promote in rural areas? Remind the students not to forget to address some of the causes of urbanisation in the leaflets.

Outputs: Brochures advertising rural life.





Activity 3: *Taming the Garbage Monster*

- **Resources/Materials Needed:** Materials appropriate for a school recycling scheme, such as large containers (oil drums, plastic bins) for paper, plastics, metals; Area for compost unit
- **Target Age Group:** Intermediate, Advanced
- **Curriculum areas:** Science, Language, Mathematics
- **Method Used:** Discussion, Action, Survey
- **Safety:** After any handling of 'waste' the students must always wash their hands.

Introduction

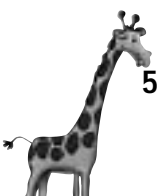
Every one of us is a part of the Garbage Monster. Every time we eat a sweet and we put the wrapper in a bin - or on the street - some one has to pick that wrapper up, take it to a disposal site and bury it, burn it or recycle it. That is what happens with every single thing we throw in the garbage bin - the waste is hauled away and buried in a landfill, recycled, or burnt.

Somebody has to organize, pay for, and monitor waste management. If countries do not have the resources or policies for this, or there is simply no waste management scheme, waste is often burned on the spot or rubbish just sits on the street and smells until somebody burns it.

Sometimes waste can be reused or recycled, which is better for the environment. This exercise encourages students to look at how much waste is produced locally, and how this waste can be redirected before it goes to the dump or the streets.

Process

- ▶ If you want to take this very seriously, you can sort and weigh the school garbage from the trash bins to see how much of it could be recycled or composted. But there are serious safety concerns in this exercise, so we urge you not to try it unless you have full parental approval (see Annex I) and, perhaps, partnership by youth activity leaders with experience on the project.
- ▶ Ask the students how clean and tidy they think their school rates on a scale from one to four: [very tidy] 1 2 3 4 [very dirty].
- ▶ Discuss what the students regard as the dirtiest place. What are the sources of waste?
- ▶ Organize a school clean up week or participate in the Clean Up the World Campaign (see teacher's note): divide the class into groups and give each group a task to remove plastic bags, papers and other rubbish from parts of the school or the school grounds.
- ▶ Use the recycling points in or near your school, if they are there (for example containers for glass and paper recycling, compost heaps or organic waste bins, batteries and chemical waste deposits



Urban & Land



for paints). If these bins are not available, divide the waste as if they were to see how much garbage could be redirected.

▶ Then ask the students again to rate how clean and tidy the school is to see how much the average has improved.

▶ If you have received a favourable response after the clean up and if there is no waste reduction, reuse or recycling system in your school, you can think with your students of a way of influencing the school's waste management practices.

▶ Ask the students to put together an action plan, indicating the problems and possible solutions the children see, which can then be presented to the headteacher or governors. Each group writes about the particular place where they did the cleaning and the contributions are combined in one action plan.

Note

In conjunction with UNEP, Clean Up the World enlists the services of community groups, schools and individuals committed to making a change. Clean Up the World Day, an initiative of Clean Up Australia in collaboration with UNEP, takes place every year in the 3rd weekend of September. For further information, send an e-mail to: world@cleanup.com.au.

To Conclude

Try to think how running a waste management system could be linked to the curriculum so that it could be managed by the students as part of their lessons. If you come up with a good plan, perhaps the students can promote it for use in neighbouring schools.

Encourage students to repeat the waste audit at home. See if they can learn new ways to reduce waste from their parents, such as by reusing glass bottles in the home, or if they can teach other family members how to redirect their waste.

Outputs: School action plan for waste reduction, reuse and recycling.





Teaching Module 6: *Policies and Emerging Issues*

Rationale

Sustainable development is the key concept in environmental policy. It means meeting the needs of today while ensuring that the future generation can also meet their needs. In order to attain sustainable development, governments must act locally and globally to create change. Agenda 21 is a voluntary agreement by governments for sustainable development. In addition there are many Multilateral Environmental Agreements (MEAs) in place that work towards achieving sustainable development. For example:

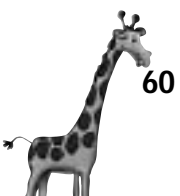
- the Basel Convention deals with hazardous waste
- the Montreal Protocol aims at sustaining the ozone layer in the atmosphere
- the CITES Convention protects rare and endangered plants and animals

But signing these agreements is only the beginning of the struggle. Governments must then work towards their international commitments by changing the existing practices.

This Teaching Module is about understanding and applying the concept of sustainable development and forms an introduction to environmental policy. Students will explore how governments can translate international commitments into action by changing their domestic policies.

Module 6 Aims at

- Encouraging students to think from the perspective of different decision-makers shaping environmental policies;
- Enabling students to explore key MEAs and how governments implement environmental policy;
- Empowering students to make decisions and debate issues of environmental importance, globally, regionally and locally;
- Encouraging students to apply policy in their own lives by creating an environmental agenda for their school.



Policies



Objectives

- To understand and apply key terms, like sustainability, MEAs and voluntary agreements
- To make students familiar with key agreements: Montreal Protocol, Agenda 21, CITES
- To explore and understand different policy options for governments
- To encourage critical thinking by having students develop their own environmental policy
- To understand what an emerging issue is, and the potential impact of some of these issues.

The activities for this module, the title, and key content of the topics are indicated in the table below. The table also provides guidance on the target group for the different activities of the module and indicates the sections in PACHAMAMA that the activities are relevant for to assist you in your teaching of the students' text.

Activity no.	Title	Key content topics	Target age group	PACHAMAMA
1.	Government Action	Environmental policy	Advanced	P. 64
2.	Emerging Issues	Exploring issues and priorities	Intermediate, Advanced	P. 68-71
3.	New Ideas for Governments	Developing policy	Basic, Intermediate, Advanced	P. 65-67
4.	Create a Local Agenda 21	Developing policy, taking local action	Intermediate, Advanced	P. 72-75

Activity 1: Government Action

■ **Resources/Materials Needed:** Copies of Agenda 21, CITES, Montreal Protocol, Basel Convention (reports can be found in libraries or on the Internet); Space for the 6 groups to work independently; Flipcharts

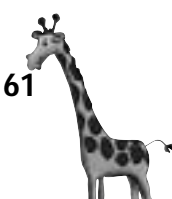
■ **Target Age Group:** Advanced

■ **Curriculum areas:** Drama, Geography, Citizenship, PSHE, ICT

■ **Method Used:** Group Discussions, Presentations

Introduction

Governments often find themselves in the international arena debating issues and agreeing to take action on certain subjects. Agenda 21 and MEAs, such as CITES, are outcomes of such debates.





Once they sign an agreement and commit themselves in words, governments then have to return to their country to put their words into action. This activity allows the students to debate and take action just like their governments do.

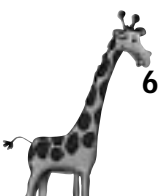
Sustainable Development

"Sustainable Development is the ability to meet the needs of today's generation without compromising the ability of future generations to meet their own needs."

(Our Common Future, Brundtland Report)

Process

- ▶ Raise the issue of "sustainable development" with your class. If already discussed in Module 1, refer to the class' glossary of environmental terms. If not, review the idea of sustainability and ask the class, "what makes development sustainable?"
- ▶ Development usually involves taking something from the earth. Ask the students for their ideas on how we can ensure that when we take something from the environment, like trees from a forest, we are giving it enough time, space and nutrients to recover.
- ▶ An important role of governments is to make policy to ensure that their country can continue to develop. MEAs are agreed to by governments to protect the environment and ensure that development is sustainable. Read pages 62 and 63 of PACHAMAMA in the class, which gives an overview of some examples of MEAs.
- ▶ Divide the class into 6 groups. Each group gathers in a different corner of the room and chooses a government to represent - one from each of the different regions of the world: West Asia, Latin America, North America, Europe and Central Asia, Africa and Asia and the Pacific. The students can then begin to conduct a search of various different conventions and agreements (possibly as a homework assignment or library time). As a teacher, you can choose one MEA for them to focus on, or several different issues and agreements. You may choose to select an issue that has particular relevance to your region.
- ▶ Ask the students to look at page 64 of PACHAMAMA: assess the different options for action that governments have available and let each group discuss what their government is going to do domestically to abide by the international agreement. For example, if you chose the Kyoto Protocol, decide how your government is going to reach the emission targets that they agreed to.
- ▶ Give each "government" 30 minutes to brainstorm and then ask all groups to make a report of proposed actions.
- ▶ List each government's initiatives on a board, and let the class then assess at the end which initiatives are most practical, effective, and creative.



Policies



To Conclude

For this exercise the students have got to be inventive and practical. It is not enough to say "We are going to make laws!" They have to say which laws, and have some practical ideas about how to enforce them. Also, it is not enough for them to say "We will set up national institutions!" What institutions? To do what? How will they set "Intelligent Prices"? Will they impose Green Taxes? What goods will they target? How will they deal with social and economic issues? If they need money from rich countries, how will they persuade them to give it? Do they want public participation? Probably, but how will they secure it? The most important role for the teacher here is to make them THINK!

Outputs: Report of proposed actions to implement a MEA.

Activity 2: *Emerging Issues*

- **Resources/Materials Needed:** Space for the 6 groups to work independently; Flipcharts; Materials for report
- **Target Age Group:** Intermediate, Advanced
- **Curriculum areas:** Drama, Citizenship, PSHE, Geography
- **Method Used:** Research, Essay Writing

Introduction

If you live in an old house, you will know the problems: you just fixed the heating, then the roof springs a leak; you fix that, then you find some floorboards are rotting. You repair them, and then you see the window frames are loose... The same problems exist with global development. For every scientific and technological advance we make, a brand new unexpected problem jumps up and bothers us.

Process

- ◆ If the class did Activity 1 of this Teaching Module, keep the same "government" groups. Otherwise divide the class into six groups.
- ◆ Half of the groups will explore 'emerging issues' - those problems that no one expects but which can surprise you when you are least expecting it. Give them some newspapers to look through in search for global and local emerging issues. Pages 68 and 69 in PACHAMAMA are helpful in explaining what emerging issues are and give an overview of the three kinds of emerging issues that GEO-2000 defines.
- ◆ The other half of the class (still in groups) will examine the list that the scientists came up with on pages 70 and 71 of PACHAMAMA. Ask the children to write up those environmental issues from the list, which concern them most. Ask each group to explain their choice.
- ◆ Compare the "emerging issues" that the children came up with in the first group, and then the "important environmental issues" that were selected from the second half of the class. Are the two lists similar or different? It is possible that the expert list from the second group includes many problems that the





students may not feel locally... or the local problems may not have made it onto the global list? Ask the students why the lists differ. Are there any local problems that are caused by global issues, such as hurricanes and weather changes caused by climate change or garbage problems because of urbanisation?

▶ Ask the students to look at both lists and think about which issues are of most concern to them locally. The students can then come up with some new emerging issues that are vitally important to their future.

▶ Hold a debate in class and vote on which issues are of greatest priority to your students and local community. Create a list on the board from greatest priority to least. Compare this final local list of importance to the “what scientists say” list on page 71 of PACHAMAMA. Keep the list for future activities.

To Conclude

Prevention is better than cure, people say. Early warning of emerging issues is also better than solving environmental problems once they are clearly there. It is not enough to identify emerging issues: it is equally important to anticipate these problems by taking action to prevent further environmental damage. A good way to conclude this activity is therefore to ask the students to write an essay in which they outline one of the emerging issues discussed, and actions that in their opinion need to take place to counter the emerging problems. It will stimulate the students to include some of the aspects they learned about earlier in this Teaching Module.

Outputs: List of prioritised emerging themes; Essays on policy action.

Activity 3: *New Ideas for Governments*

■ **Resources/Materials Needed:** Materials for display work

■ **Target Age Group:** Intermediate, Advanced

■ **Curriculum areas:** Science, Language, Mathematics

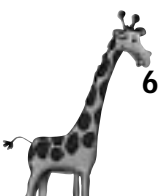
■ **Method Used:** Citizenship, PSHE, Geography, Science

Introduction

The school children today will be the world leaders of tomorrow. Throughout this lesson, the students are encouraged to think like policy makers in governments: to plan, strategize, be inventive and practical at the same time. In this activity there is a chance for the students to think about how their school can impact their community in a positive way.

Process

▶ You can use the same – or maybe change - groups of students as in Activity 2.



Policies



◆ Go through the GEO ideas for improving government actions on the environment on page 65 of PACHAMAMA. There are several of them - promote cleaner technology, impose carbon taxes, remove 'perverse subsidies' (government subsidies on activities that damage the environment); integration of decision-making - or what is sometimes referred to as 'joined up government'!

◆ Look with the class at the young people's ideas (pages 66-67) - their commitments, their ideas for more sustainable consumption, for Youth Councils, compulsory environmental education and so on.

◆ Write these ideas up on a flipchart or a blackboard, then ask each group to brainstorm for 15 minutes, decide what they think about them and come up with some new ideas – for instance ones to deal with the emerging issues they have identified in the previous activity.

◆ Add these new ideas to the board and finish up with a long list of priorities.

◆ Then ask the groups to think about whether any of these issues can be addressed at school level. In what ways can the school contribute to the environment of the community?

To Conclude

Depending on the outcome of the activity, the students can think of a way to work towards getting these ideas included in the school policy and the curriculum. This activity leads into creating a Local Agenda 21 for your school in Activity 4 in this Teaching Module.

Outputs: Proposals for school curriculum or policy.

Activity 4: *Create a Local Agenda 21*

- **Resources/Materials Needed:** Agenda 21; Your local authorities' own Local Agenda 21, if available
- **Target Age Group:** Intermediate, Advanced
- **Curriculum areas:** Geography, Drama, Language, Science, Citizenship, PSHE
- **Method Used:** Simulation, Role Playing

Introduction

The logical extension of all the previous activities is to create a Local Agenda 21 – an agenda for action to promote the sustainable development of your local area. If a Local Agenda 21 already exists, this is a chance to scrutinise it and make it better; if none exists, this is the chance to create one.



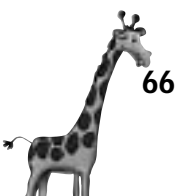
Process

A Local Agenda 21 is a community action plan that aims to conserve the natural environment while at the same time increasing the prosperity of its citizens. Your community may have a Local Agenda 21. If so, visit your local Municipal Council and ask for a copy. Look through it and see if the students have any ideas to improve it. If there is no Local Agenda 21:

- ▶ Invite the students to sit around a large table to create a Local Agenda 21 as if they are the local council.
- ▶ Review the problems, issues and new ideas identified in Activities 1-3 above.
- ▶ Encourage the students to identify the priorities for your community's development and design an action plan outlining how to achieve these priorities.
- ▶ Encourage the students to take on responsibilities and roles of different people in the community. For example one councillor who supports the business community, another who supports the sports community. Another is an ardent nature conservationist, another represents the elderly people, another is an educator, and so on.
- ▶ Help them think through the different topics to discuss and debate while they act out their chosen roles. They can use their Local Agenda 21 priorities that they created in previous activities to refer to during their discussion. For example:
 - The businessmen and the sports councillor may want a nice golf course to attract bigger businesses to the area.
 - The nature conservationist is thoroughly opposed - golf courses use huge amounts of water and fertiliser, and tear up woodlands and natural habitats.
 - The council wants to expand the community so that there are more citizens paying local taxes to increase their income.
 - The nature conservationist and the farmers are opposed to building by contractors over agricultural land and want to limit further residential development.
- ▶ Remind the students that they need to come up with a plan: decisions need to be made so they cannot stick too strictly to their role. As they strive for consensus some flexibility is needed.

Note

Role playing is an important element in this activity. However, some students might find it difficult to play one of the roles mentioned above. Alternatively, the students can identify themselves with one of the authors giving their opinion about the environment in PACHAMAMA. From pages 72 to 76, the book gives an overview of "What other people think".



Policies



To Conclude

You may be familiar with some of the computer games such as 'SimCity'. Those who have access to this computer game will be able to assess their real issues through it. The program asks you to give your plans for a community, like building more factories, and then calculates how the environment and community will be affected.

Another option to conclude this activity is the Rescue Mission Cabaret: this is a very simple way of creating an Instant Local Agenda 21 using an audience of adults or children. The concept uses the idea of a musical being performed in a time warp.

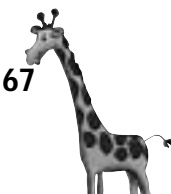
Instant Local Agenda 21

The story line is that some children are performing a musical show in the year 2025. All the problems of today are solved and during one Festival Day, someone asks how it was done. They are told that it was all a result of a brilliant plan called Local Agenda 21. But – they have lost the document! They cannot find it anywhere! Suddenly they notice that the audience is in a time warp - and that they are all actually dressed like people of more than 20 years ago! So they would know the problems! They would know about the background and be able to build the Local Agenda 21 from their own experience. So the children get out amongst the audience, ask questions about the state of the environment and environmental activities and develop in this way the skeleton of the Local Agenda 21 – using the audience's concerns.

You can perform the cabaret in front of parents, local councillors, a social club – anyone! And after each performance, the students can build up the Local Agenda 21 based on outcomes. It is a great way to consolidate all they have learned.

Outputs: Student's own Local Agenda 21.

Module six





Teaching Module 7: *What can young people do?*

Rationale

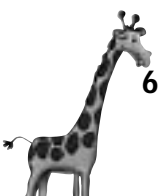
The last Teaching Module is about what young people can do. This is the moment to raise an extremely important issue for the students: to realise that they are not alone. All over the world young people organise and take action for the environment. PACHAMAMA gives an overview of some of the activities and actions taken by young people. Almost every member of the public, every political and business leader shares some concerns about the environment. Adults however often have other pressures - to put food on the table, to pay the rent, to earn income for shareholders, or to win the next election - but they all have at heart the same concerns as the students.

The activities in this Teaching Module encourage students to build upon the knowledge and empowerment they have gained throughout the activities in this guide, and channel their energy into action.

The first activities focus on what other young people have done locally in their community and elsewhere in the world. With this knowledge students will be able to review the Local Agenda 21 - and develop a Youth Action Plan to implement in their own neighbourhood. Although this will not necessarily take place, the positive examples will encourage young people to take responsibility for their environment, because they are able to make a difference. The last activity is based on the game at the end of PACHAMAMA. The game provides the students with a fun way to resume and test their knowledge after studying PACHAMAMA step by step through the activities and questions in this Teacher's Guide. In order to play the game well, the students need to go through what they learned in the previous chapters and as such the game is an important tool to consolidate some of the issues raised in this course. It will also show the students that they actually learned a lot.

Module 7 Aims at

- Providing some guidance for activities that can empower young people to take responsibility for their environment;



Action



■ Enabling students to become acquainted with the examples in PACHAMAMA that show and explain to them how young people can build alliances for the environment - maybe even lead alliances, especially within their local communities.

Objectives

- To understand that young people have an important role and responsibility in protecting the environment
- To explore the variety of activities that young people have done in different parts of the world
- To develop an Action Plan for what your students can do to conserve and protect the local environment
- To engage in some stimulating debates about the environmental issues that affect young people
- To consolidate the knowledge that the students have acquired in the previous 6 modules
- To have students appreciate the protection of the environment

The table below indicates the activities for this module, the title, and key content of the topics. It also provides guidance on the target group for the different activities of the module and indicates which sections in PACHAMAMA can assist you in your teaching.

Activity no.	Title	Key content topics	Target age group	PACHAMAMA
1.	Young Action!	Success stories of environmental action	Intermediate, Advanced	P. 80-84
2.	The Huge Advertising House Agency	Role of media	Intermediate, Advanced	P. 78-79
3.	Review the Local Agenda 21	Planning environmental action	Intermediate, Advanced	P. 80-84
4.	The Youth Environment Security Council	Synthesis of environmental action globally	Advanced	P. 76
5.	Playing the Game	Synthesis of environmental information	Basic, Intermediate, Advanced	P. 84, 92-96, Inside back cover



Activity 1: *Young Action!*

- **Resources/Materials Needed:** Back copies of newspapers; Library; Relatives
- **Target Age Group:** Intermediate, Advanced
- **Curriculum areas:** Language, Science, Geography
- **Method Used:** Research, Writing

Introduction

Young people are often surprised to discover that people, including youth, have been campaigning for the environment for decades if not centuries. Young people are active all over the world. Looking at past local youth action can be an inspirational way to getting started on their own campaign.

Process

To prepare this activity, visit the library or the Internet and search back editions of local newspapers, environmental magazines and national newspapers.

▶ Ask your students to go through the material and find stories about young people getting involved in environmental conservation. Encourage them to look especially in the local newspapers to assess how effective youth action has been in your area. If there is not enough information available, you can also rely on the cases described in the "Eco Times" section on pages 80-84 of PACHAMAMA.

▶ Ask the students to list the issues young people have addressed and the actions they have taken on a piece of paper. Hang the outcomes on the wall for further analysis.

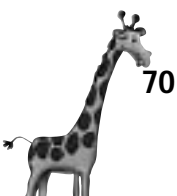
▶ See if a pattern emerges of what young people are particularly effective in doing, for example community clean ups, recycling or tree planting.

▶ Look back a few years and see what the issues were for young people historically. Have the issues changed? Discuss in the class if there is anything the students learned from what young people were doing ten or twenty years ago.

To Conclude

You may wish to continue this activity in a homework assignment. Ask the students to talk to their parents, people in the community, shop-keepers or others to hear from them what their interests in the environment were when they were young. After the students report back, one way to conclude the activity would be to encourage the students to write a short history of youth environmental activism in their local community, country or region of the world. The best histories can be submitted to a local or school newspaper.

Outputs: List of local environmental youth activities; Short histories on youth environmental activism.



Action



Activity 2: *The Huge Advertising House Agency*

- **Resources/Materials Needed:** Art materials suitable to produce a commercial advertisement
- **Target Age Group:** Intermediate, Advanced
- **Curriculum areas:** Drama, Science, Geography, ICT
- **Method Used:** Group Work, Acting, Script Writing/Development
- **Safety:** Ensure that there is enough safe space for each group to practice in safety

Introduction

Advertising has driven people into an insatiable frenzy of consumption. Advertising has created a market and thirst for 'needs' for a range of products. Some environmentalists tend to think of advertising as completely negative – but does it have to be? Advertising a mobile eye hospital or an energy-saving device is not necessarily bad for the environment. In this activity students themselves will explore how advertisements could contribute in a positive way to the protection of our Earth.

Process

- ◆ Divide the class into small groups of 3-4 students and invite them to imagine they are the creative directors of a Huge Advertising House Agency (HAHA).
- ◆ Ask one of them to dress up as an unusual client, called PACHAMAMA, who walks into the group and announces that she has several million dollars to spend on an extensive campaign to save and protect the environment. She wants to promote all the ideas the students have been learning about in this course – reduce the emissions from cars, protecting wildlife habitat, stop pollution of water and soil, and so on. The question to the students is how they are going to do this. How are they going to use a medium that is all about selling things - and use it to sell an environmental idea, maybe even about NOT buying things?
- ◆ Ask PACHAMAMA to read out the list of "Commitments" on page 78 and "Plant a Tree" on page 79 in the PACHAMAMA book, so that the students can select a subject.
- ◆ The assignment will be to develop a script for a 5, 20, or 60- second commercial and, if possible, illustrate it with 'storyboards' - this is a frame-by-frame presentation of what the final commercial is going to look like.
- ◆ The students can then brainstorm in their groups, and plan their commercial, write it up, and present their finished work to the rest of the class.

To Conclude

Maybe you can arrange an Earth Advertising Award ceremony – to give a prize for the best Earth





Commercial! If possible, see if another class that has not been doing the PACHAMAMA activity would be willing to be the judges, or present the commercials to the whole school at an assembly. Maybe it is possible to have a commercial break during, for example, the annual school play.

Output: TV style commercials on the environment for use in assemblies and other events.

Activity 3: *Review the Local Agenda 21*

- **Resources/Materials Needed:** Students' Local Agenda 21 from Module 6
- **Target Age Group:** Intermediate, Advanced
- **Curriculum areas:** Drama, Science, Language, Geography
- **Method Used:** Development of Strategy

Introduction

The PACHAMAMA story so far has concentrated on understanding where our planet has got to on its journey. It is only by understanding our present situation that we can confidently plan the next part of our journey - the part that takes us into the future. This activity is developed for youth group leaders and teachers to assist young people in planning to take environmental action in their local community. It aims at reviewing the Local Agenda 21 - and developing a Youth Action Plan to implement it. Teaching Module 6 provides your classroom with a Local Agenda 21, including a comprehensive list of actions taken by young people both locally and internationally. This next activity carries this process forward.

Process

- ◆ In preparing for this activity, provide the students with an opportunity to review the Local Agenda 21 the class developed to see which youth actions most appropriately address the issues facing your local environment.
- ◆ Encourage your students to think about how they can take action on these issues. The students can develop a step-by-step strategy for youth to implement the Local Agenda. This may include a calendar, or timeline, forecasting the activities the students may wish to undertake.
- ◆ Address the Local Agenda 21 that the students created. What barriers are there to making it happen? Thinking of these barriers beforehand will help the students solve the problems before they arise.
- ◆ Encourage the students to think about what aspects of the Local Agenda 21 are left out - what can be done about those issues?
- ◆ "A better environment starts with yourself", is the slogan used in advertisements about the environment in the Netherlands. PACHAMAMA offers the readers a chance to find out how "green" they



Action



are on pages 84-85. Ask the students to fill in the questionnaire and to look at their score. Is there a particular item each of them personally wants to work on? Encourage the students to write out a mission statement of how they will change one personal activity to become more "green".

If the students want to campaign for an environmental issue, explore some of the existing institutions that are already set up to provide assistance. What 'instruments' do they have to work with? Is there a local Youth Municipal Council - or a youth branch of a local environmental group - or a youth column in the local newspaper? It can also be helpful to teach the basic components of a campaign - petitions, letter writing, a march or demonstration.

To Conclude

It is important to encourage the students to focus on specific issues. It is very easy for the students to feel overwhelmed by all of the problems PACHAMAMA raises. But if they try to focus on one area, and can see the difference they are making, in their own lives and lives of others, then they will start to see that one child can make a difference. Which of the many issues in front of them are they going to concentrate on? Explain to the students that if they spread themselves and their energy too thin, they will end up not being as effective. It is much more effective to cooperate and make achievements step by step. A successful action will give the students the unparalleled thrill of winning something for the environment!

Output: Youth Action Plan for Local Agenda 21.

Activity 4: *The Youth Environment Security Council*

- **Resources/Materials Needed:** Classroom set up as a 'council' horseshoe
- **Target Age Group:** Advanced
- **Curriculum areas:** Drama, Citizenship, PSHE, Geography, Science
- **Method Used:** Simulation, Drama, Research, Debates

Introduction

In the corridors of the United Nations, diplomats have been talking for years about setting up an Environment Security Council. It has never happened, partially because governments do not like international bodies interfering with their national sovereignty (control over their own policies). But with everything your students have learned so far, they can try to set one up in your classroom. The activity gives the students the opportunity to show that it is possible to create a global environmental governing council.

Process

- ◆ Read the poem "The Future" on page 76 in PACHAMAMA or listen to the song "The Future" on the "GEOactive" CD-ROM (see page 83).





Seven

▶ Explain to the students that the future will partly be in their hands. Tell them what a Security Council is and that they are going to create one to address the environmental issues in order to take care of the future. Encourage them to create a name for this council.

▶ Set up the first meeting of the International Youth Environment Council (or whatever your class decides will be its title). Appoint representatives from the six regions of the world we refer to in PACHAMAMA - Asia and the Pacific, Africa, Latin America and the Caribbean, North America, West Asia, Europe and Central Asia. The team - or 'delegation' - from each region must review the issues that have come up in the course of the lessons.

▶ Then each delegation must come up with a set of 3 resolutions to discuss at the meeting. These resolutions can be anything - from a demand to ban the production of genetically modified crops, to a commitment by young people to educate themselves and each other about the environment. The resolution can relate directly to the region, such as a West Asian resolution on water conservation, or to a global concern.

▶ Explain the course of the activity and give the students some time to do a little research so that they can think realistically like the people of the region they represent: African delegates might be interested in cleaning up their cities with new recycling technology; Latin American delegates might want the right to exploit their rain forests, or be paid by the rest of the world for protecting and conserving them, and so on. Assist the groups in focussing as much as possible on commitments to things that young people can do by themselves.

▶ If possible, set up your desks or tables in the shape of a horseshoe - like the real UN Security Council. Call the representatives together in the council. Introduce yourself as the Secretary General of the Council.

▶ Each region will come up with its own ideas and proposals, which you can call resolutions. At the start of the meeting, each delegation must 'table' their resolutions (present them to the council of delegates). If any of them are the same - or very similar - combine them.

▶ The delegations debate the resolutions as a Council. You may wish to make the debate formal, with timed presentations and a speakers list.

▶ Once the issues are debated, and minor changes are made to the resolutions, the delegations have an opportunity to vote or to decide if they are willing to sign the resolution.

To Conclude

End the meeting with a set of resolutions passed by the Council maybe placed in order of priority. Discuss afterwards how it was to represent the interests and issues of a different region in the world. Did the different perspectives make a change in the way the students thought about environmental issues?

Output: Student resolutions on environmental security and sustainability.





Activity 5: *Playing the Game*

- **Resources/Materials Needed:** PACHAMAMA'S Eco-Mind Maze game; Cards, Crayons; Pieces to move around the board; Prize(s) for the winner(s)
- **Target Age Group:** Basic, Intermediate, Advanced
- **Curriculum areas:** Drama, Citizenship, PSHE, Geography, Science
- **Method Used:** Homework, Group Work

Introduction

This activity will help students to revise the different modules they have worked through. It is the only activity where it is strongly encouraged that the students do a homework assignment before the lesson. It is the final activity of the Teacher's Guide and it is important that students prepare for it as a kind of 'End of Course' Party.

Process

- ◆ Explain the basic ideas of the Eco-Mind Maze game, printed in the back of PACHAMAMA, and divide students up to do the duties in preparation:
 - One group can prepare the question cards;
 - Another group can make special circular cards for the circular questions - adding questions of their own as they make them.
 - The third group can make or find pieces for each team to use on the game-board;
 - The fourth group can make, or find, appropriate prizes for the winning team;
 - And finally, REVISION! - Every group should read through PACHAMAMA again to make sure they will be able to answer all the questions.
- ◆ If it is a large group, divide the group into six teams, but make sure that you circulate the questions so that it is not just one team member answering all the questions.
- ◆ Simply play the game as per the instructions on page 92 of PACHAMAMA.
- ◆ Identify winners of the Game!

To conclude

If the students did not yet do the "How Green are You?" quiz on page 84 of PACHAMAMA, this questionnaire can be used to conclude this activity. As this is the last activity, try to organise an environmental friendly picnic to celebrate the end of the course. A minimum of packaging must be used and absolutely no litter must be left, no flowers gathered, no damage done to the environment: "Take only photographs, leave only footprints". Enjoy yourselves and enjoy the natural environment!

Output: Well-informed students on environmental issues covered in PACHAMAMA.





HandOut

Two

Activity Two

Model of reporting an experiment

A report of a scientific experiment consists often of the following elements:

Introduction:

Give some background information in this section. Explain what the reason was for doing the experiment. For example, there is little knowledge about the subject, or it is part of a series of experiments in a scientific course. Clearly state the aim of the experiment in the introduction. What do you want to achieve with the experiment? For example, more insight in the subject or an explanation of how something works.

Hypothesis:

State in one sentence what you think the result of the experiment will be. This is what is called your hypothesis. So you say here what you think will happen, in advance! This can be true or not. You will find out after the experiment.

Materials & methods:

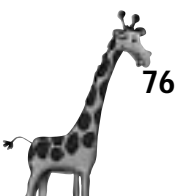
Tell the reader of the report what kind of materials you used (for example, water, cup, piece of glass, magnifying glass) and describe how you conducted the experiment. For example: "First, you put the water in the cup. Then you put a small drop of water on the piece of glass. Subsequently, you study the water drop with a magnifying glass." You can use drawings to show the set up of the experiment.

Results:

Describe the results of the experiment. What did you find out? Did you see anything, or did you observe any change? Maybe you smelled something. Use drawings if necessary to clarify what you observed.

Discussion and conclusions:

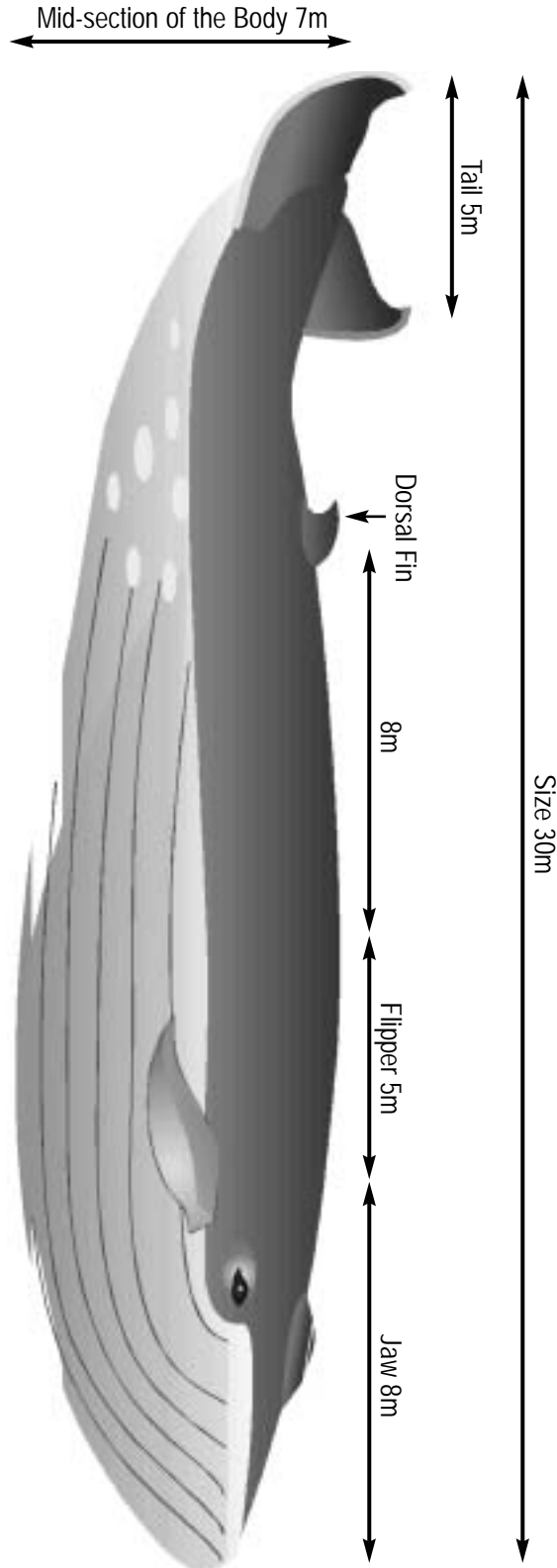
In the discussion and conclusions try to explain the results of the experiment with the knowledge you have. You can now conclude whether or not your hypothesis was true. If the experiment showed the same result that you expected beforehand, the experiment supports your hypothesis. If it does not, then there is no evidence that your hypothesis is true.



Three

Activity Three

Outline Blue Whale



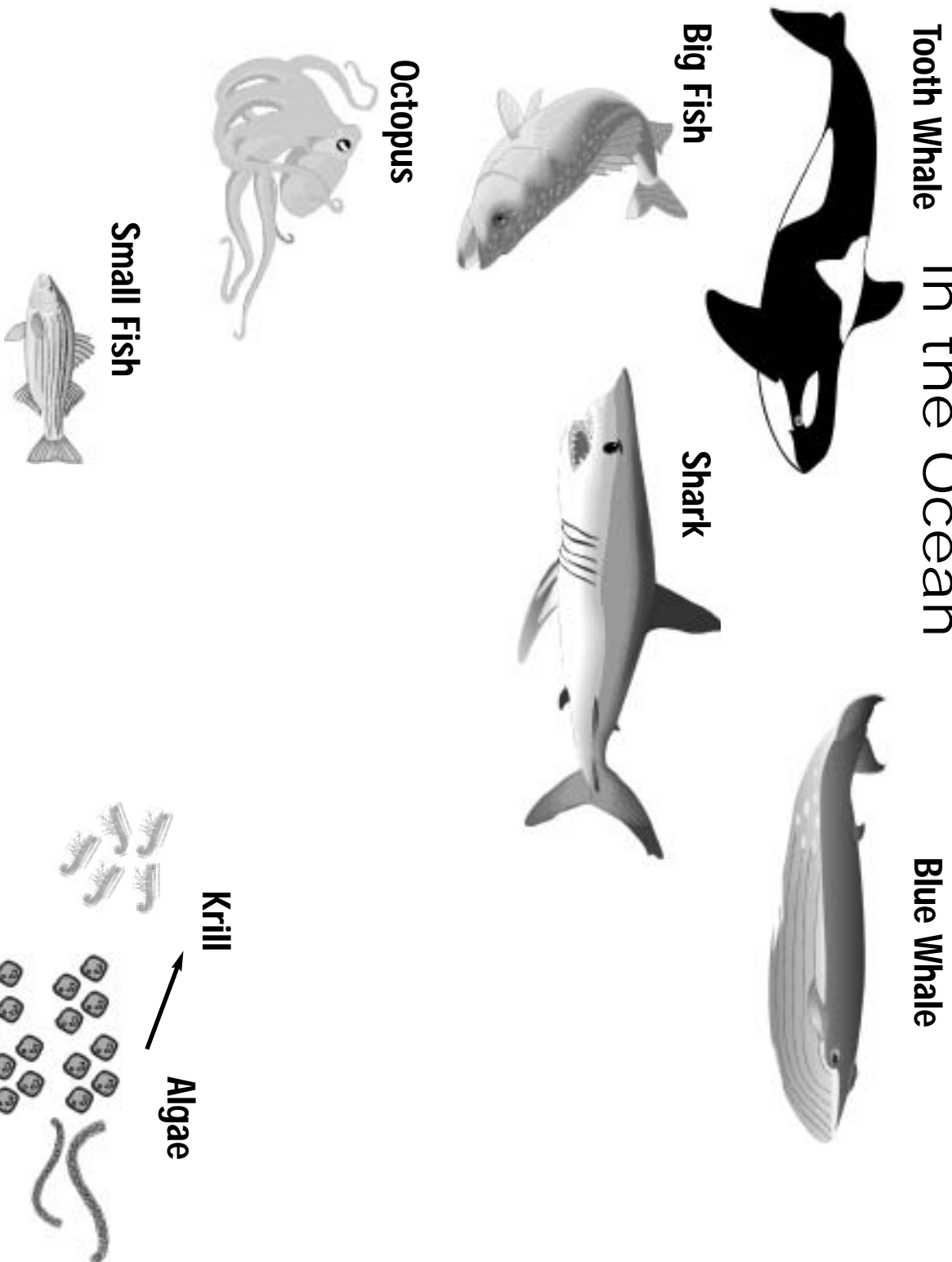


HandOut Three

Activity Three

Link the different sea animals with arrows so that you create a food web. The first arrow is already there, showing that the algae in the sea are eaten by the small animals, called krill.

Food Web in the Ocean

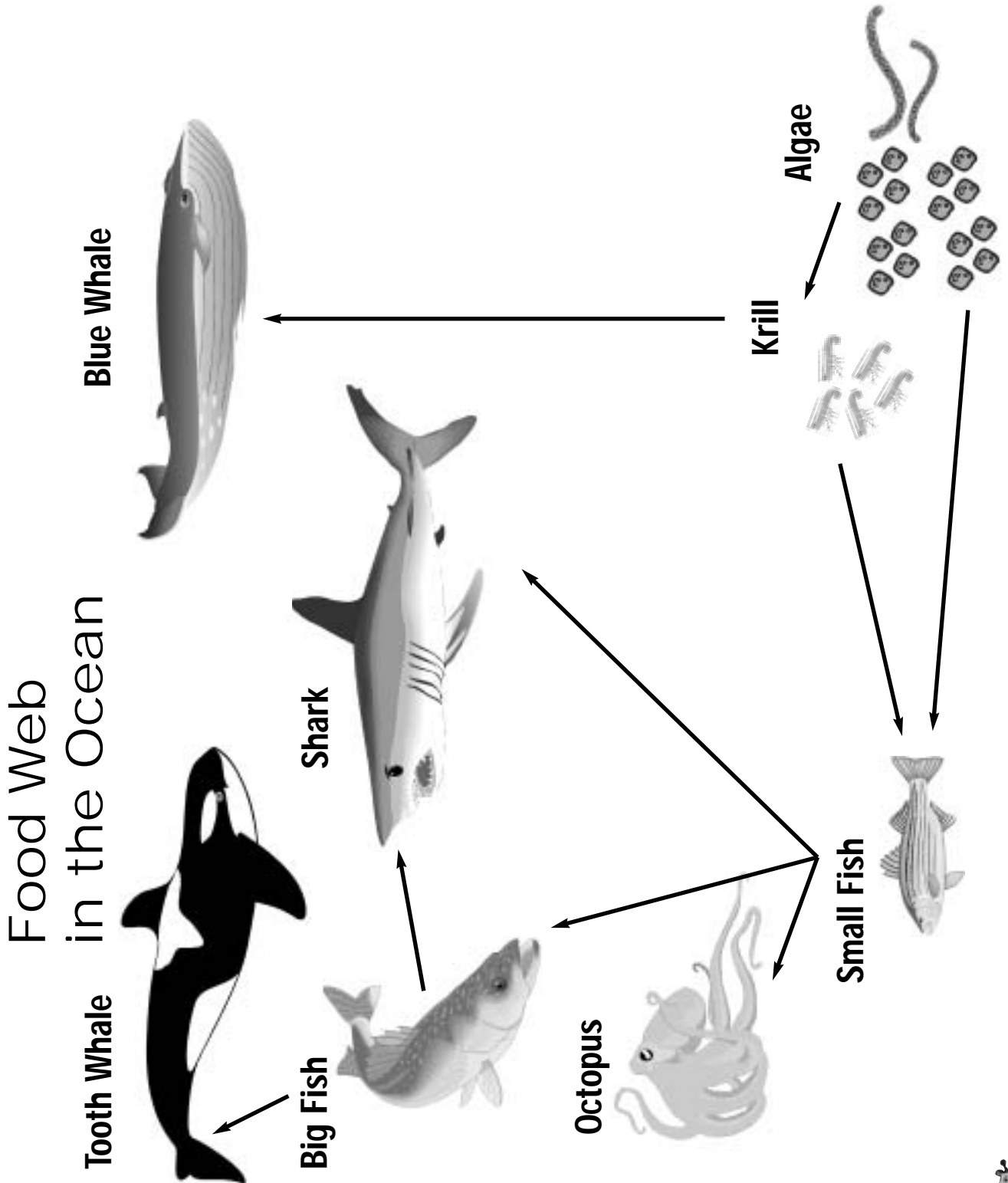


Three

Solutions



Food Web in the Ocean



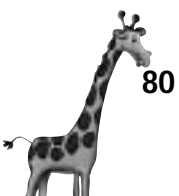


HandOut Three

Activity Four

Turtle Drama Actor List

Role	Name
Story Teller(s)
Turtle
Friend
Humans with Spears
Coral Reef
Humans with Hooks and Tools
Young Turtles in Eggs
Humans with Construction Machine



Description of Plant or Tree



To identify a plant or tree you need to study it carefully. This list of questions gives you an indication of the kind of characteristics that are important to distinguish one type from another. Some of the questions you can answer by making a drawing.

- a. Size of the Plant/Tree:
- b. Wooden Parts of the Plant/Tree:
- c. Shape of Leaves:
- d. Size of Leaves:
- e. Shape of Flowers:
- f. Size of Flowers:
- g. Colour of Flowers:
- h. Number of Flowers:
- i. Smell of Plants:
- j. Size, Colour and Shape of Seeds or Fruits:
- k. Description of Location¹:
- l. Remarks²:

If you study a plant or tree over a longer time period you can also indicate:

- m. Time of Flowering:
- n. Time of Fruit Setting:

¹ Is the plant growing in the shade or sun, in grassland or in forests, near buildings etc.

² Describe here any typical characteristics that are not yet mentioned above.



UNEP Information and Links

United Nations Environment Programme (UNEP)



UNEP's mandate is

"to provide leadership and encourage partnership in caring for the environment by inspiring, informing and enabling nations and peoples to improve their quality of life without compromising that of the future generations."

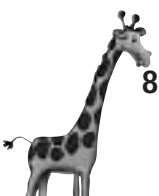
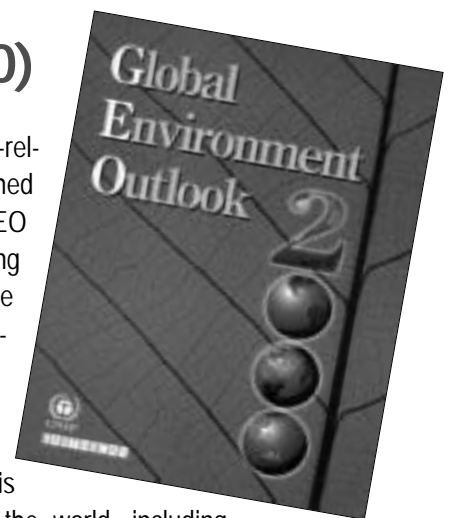
UNEP works to encourage sustainable development through sound environmental practices everywhere. Its activities cover a wide range of issues, from atmosphere and terrestrial ecosystems, environmental policy development and implementation, the promotion of environmental science and information, to an early warning and emergency response capacity to deal with environmental disasters and emergencies. Environmental information, assessment and networking, by facilitating the collection, exchange and dissemination of environmental data and information between countries and regions, are essential elements of UNEP's work. Collaborative assessments of the main environmental issues related to sustainable development are an important focus to improve international policy formulation and planning, and raise public awareness of the environmental challenges facing our world.

For further information about UNEP visit our website: <http://www.unep.org> or write to:

United Nations Environment Programme (UNEP)
P O Box 30552
Nairobi - Kenya

Global Environment Outlook (GEO)

In response to the need for comprehensive, integrated, policy-relevant assessments of the global environment, UNEP launched the Global Environment Outlook (GEO) project. The GEO report, which is prepared by UNEP's Division of Early Warning and Assessment (DEWA), is a snapshot of the state of the environment at global and regional level. The GEO assessment process is cross-sectoral and participatory, incorporating regional views and perceptions, and building consensus on priority issues and actions through dialogue among policy-makers and scientists at regional and global levels. Input is solicited from an extensive array of sources throughout the world, including Collaborating Centers, a range of United Nations organizations, and numerous independent experts. Each report in the series builds on the previous ones, expanding on the issues and linkages identified as requiring closer political, public, and scientific scrutiny. The first issue in the GEO report series (GEO-1) was published in January 1997, the second issue (GEO-2000) in September 1999, and the latest issue (GEO-3) in May 2002, in advance of the 2002 World Summit on Sustainable Development in Johannesburg.

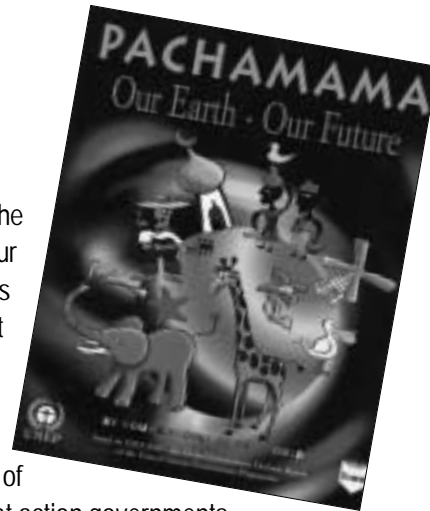


Further Information and Links



GEO for Youth

GEO for Youth is the youth component of the GEO-project. The main youth product is PACHAMAMA: Our Earth – Our Future, a book prepared concurrently with, and on the basis of, UNEP's second Global Environment Outlook report (GEO-2000).



PACHAMAMA, meaning Mother Earth in Quechua, an indigenous language of Peru, describes through the eyes of young people the state of the world's environment and what action governments, and young people are taking to address the problems we face. It is an inspiring collection of case studies, poems and drawings made for youth, by youth from all over the world. PACHAMAMA is a joint project of the United Nations Environment Programme and Peace Child International in partnership with UNESCO and UNICEF. The production of the book was made possible by a grant from the United Nations Fund for International Partnerships.

In addition to English, PACHAMAMA is published in 10 other languages: Arabic, Chinese, Danish, French, Italian, Japanese, Korean, Portuguese, Spanish and Thai.

PACHAMAMA is also available on <http://www.unep.org/geo2000/pacha/>. The website brings to life the ECOMIND Maze Game. The mirror site addresses for PACHAMAMA are:

- Japan: <http://www.cger.nies.go.jp/geo2000/pacha/>
- Mexico: <http://www.rolac.unep.mx/geo2000/pacha/>
- Norway: <http://www.grida.no/geo2000/pacha/>
- Switzerland: <http://www.grid.unep.ch/geo2000/pacha/>
- USA: <http://grid2.cr.usgs.gov/geo2000/pacha/>

GEOactive, a CD-ROM containing both GEO-2000 and PACHAMAMA, videos, games and environmental databases for youth action, can be ordered through Earthprint (see inside front cover).

For further information on GEO for Youth please contact UNEP or e-mail PACHAMAMA@unep.org

A regional GEO for Youth Project was initiated in Latin America and the Caribbean within the context of the GEO process. The aim of the project was to create a regional youth assessment report targeting young people between 15 and 25 year old from the region. The project has resulted in the publication of GEO Juvenil in October 2001.

For further information on GEO Juvenil please contact:
UNEP DEWA/LAC

Boulevard de los Virreyes No. 155 – Lomas Virreyes 11000
México D.F.
Geoyouth@rolac.unep.mx
<http://www.rolac.unep.mx/geoyouth>





Further Information about Traditional Knowledge

- Burger, J. (1990) *The Gaia Atlas of First Peoples: A Future for the Indigenous World*. Penguin Books, Ringwood
- Johannes, R.E. (1989). *Traditional Ecological Knowledge: A Collection of Essays*. International Union for the Conservation of Nature, Gland
- Kundtson, P. and Suzuki, D. (1992). *Wisdom of the Elders*. Allen and Unwin, Sydney
- Rohana Ulluwishewa (1993). *Indigenous Knowledge*. *Indigenous Knowledge and Development Monitor*, 1(3), 11-13
- Shiva, Vandana, (1989). *Staying Alive: Women, Ecology and Development*. Zed Books, London
- Warren, D.M., Brokensha, D. and Slikkenveer, L.J. (1992). *Indigenous Knowledge Systems: The Cultural Dimensions of Development*. Kegan Paul International, London
- *Indigenous Knowledge and Sustainable Development* (1996). Sri Lanka Centre for Indigenous Knowledge. University of Sri Jayewardenapura, p. vii-viii
- Indigenous Education Worldwide: <http://www.ankn.uaf.edu/IEWW.html>. This is an Internet site which lists materials, contacts, links and other resources related to indigenous education issues.
- The Earth Council Indigenous Peoples' Project: <http://www.ecouncil.ac.cr/indig/>
- Indigenous Knowledge and Development Monitor: <http://www.nuffic.nl/ik-pages/> A journal published by the Centre for International Research and Advisory Networks for Indigenous Knowledge and Sustainable Development (CIRAN) for everyone around the world who has an interest in the role that indigenous knowledge can play in sustainable development.

ANNEX I: School Visits

Whether it be a rainforest, arid grasslands, a rural farming community or the centre of a large city, the local environment is the richest resource you possess for your teaching and learning. Some schools are fortunate enough to have a rich environment within their grounds or in close proximity. This is useful as the organising and supervision for offsite work or visits is sometimes difficult. Prepare each visit carefully, particularly in relation to the safety of the students. Most practical activities, no matter how simple, have safety implications. This makes a risk management plan essential. Consult your school's or educational system's policy document on off-site visits or talk to a colleague who has experience of them. You may have an outdoor education coordinator on your staff who will be able to help arrange things for you.

These safety hints are suggested to you as the basis of your own particular safety plan:

- Get parental consent including information about any medical problems that should be known by the teacher.
- Define your area, make sure your students and school clearly know what this is.
- Check with the owner of the land or shop, for example, before your visit.
- Know where your nearest first aid point will be.
- If using public transport, is it safe?
- Make sure all students are suitably dressed or prepared for the weather conditions.
- Ensure there is sufficient adult supervision.
- Make students aware of any 'codes of conduct' that may apply.
- "Take only photographs, leave only footprints".
- Always wash hands on your return to school.
- Try to arrange the site in traffic free areas.

