



Environmental Education
Awareness Raising



Environmental Education

Climate Change

Manual for Secondary and High School



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Management of Natural Resources in the Coastal Zone of Soc Trang Province

as part of the overall Climate Change and Coastal Ecosystems Program (ICMP/CCCEP)

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Introduction

Climate change is an environmental problem which threatens to significantly alter life on this planet, potentially impacting everyone and everything that lives on Earth. Therefore it is important to make everyone aware of the potential impacts of climate change and their role in helping reduce climate change. Our children, despite being the least responsible for climate change, will be the ones who will have to deal with the consequences.

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) project; 'Management of Natural Resources in the Coastal Zone of Soc Trang Province', in partnership with the Department of Agriculture and Rural Development and the Department of Education and Training, have developed this teachers' manual as a tool to aid teachers in educating their students about climate change and its impacts.

The manual is divided into three lessons:

- Lesson 1: Climate change - what is it and what causes it?
- Lesson 2: Impacts of climate change
- Lesson 3: How can we prevent climate change?

Each lesson contains background and extra information for students and teachers as well as questions for students to answer and a list of suggested activities (such as creating diagrams, conducting local research, puzzles etc.) which are designed to enhance students understanding of climate change.

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Figure 1: Running from flood, Hồ Huyền Trân, Điện Hải Junior high school, Đông Hải district, Bạc Liêu province, drawing competition 2009, Bạc Liêu @GIZ

Lesson 1: Climate change - what is it and what causes it?

Overview: By the end of this lesson, students will have gained a basic knowledge about what is meant by the term 'climate change' and what the causes of climate change are.

Objectives: Student will

1. Explore what the term 'climate change' refers to.
2. Examine what causes climate change.
3. Explore what the term 'greenhouse gases' refers to and the main greenhouse gases of concern

Prerequisite knowledge – Teacher

The 'Background Reading' below will give teachers an overview of climate change, the science behind climate change and the main causes of climate change.

'Extra information' sections have been included as an additional resource for teachers in case they receive questions from students, or want to give their students additional information.

Prerequisite knowledge – Students

Students do not need any prerequisite knowledge for this lesson. However, prior to commencing this lesson, it is recommended that teachers gauge what level of awareness their students already have about climate change. This can be done using Activity 1 ('Mind-Bubble') which is included in Annex 1 of this document..

Potential activities

Annex 1 contains a list of activities that are designed to enhance students' understanding of climate change. Activities 1 and 2 are particularly relevant for Lesson 1, but activities 5, 6 and 8 may also be useful.

Questions for students to answer

Upon completion of this lesson, students should be able to answer the following questions:

1. What is meant by the term 'climate change'?
2. Why are greenhouse gases concentrations in the Earth's atmosphere increasing?
3. What are the main greenhouse gases of concern?
4. What human activities produce:
 - a. Carbon dioxide?
 - b. Methane or nitrous oxide?
5. What activities have you done today that have released greenhouse gases?

1.1 What is climate change?

'Climate' refers to the average weather conditions (e.g. temperatures, rain, sunshine, cloudiness, humidity and winds) that an area usually experiences over a long period of time (e.g. 30 years).

'Climate change' is the term used when the climate of an area, or the planet, starts to change.

Over the lifetime of the planet, the climate of the planet has changed naturally and temperatures have varied significantly, causing climate events such as 'ice ages'. However the global climate has never changed as fast as it is currently.

Currently, around the world, temperatures are getting hotter (which is sometimes referred to as 'global warming') and weather patterns are changing. In the past century, temperatures have risen on average around the world by 0.74°C, with most of this increase happening over the last 40 years(1).

Temperatures are predicted to continually increase by another 1.8-4.0°C this century, and up to 6.4°C next century(1). These changes to the climate could have a severe impact on humans, human activities (such as agriculture), plants and animals around the planet.

Most scientists and governments now agree that this latest climate change has been caused by human activities and that action is needed to stop climate change.

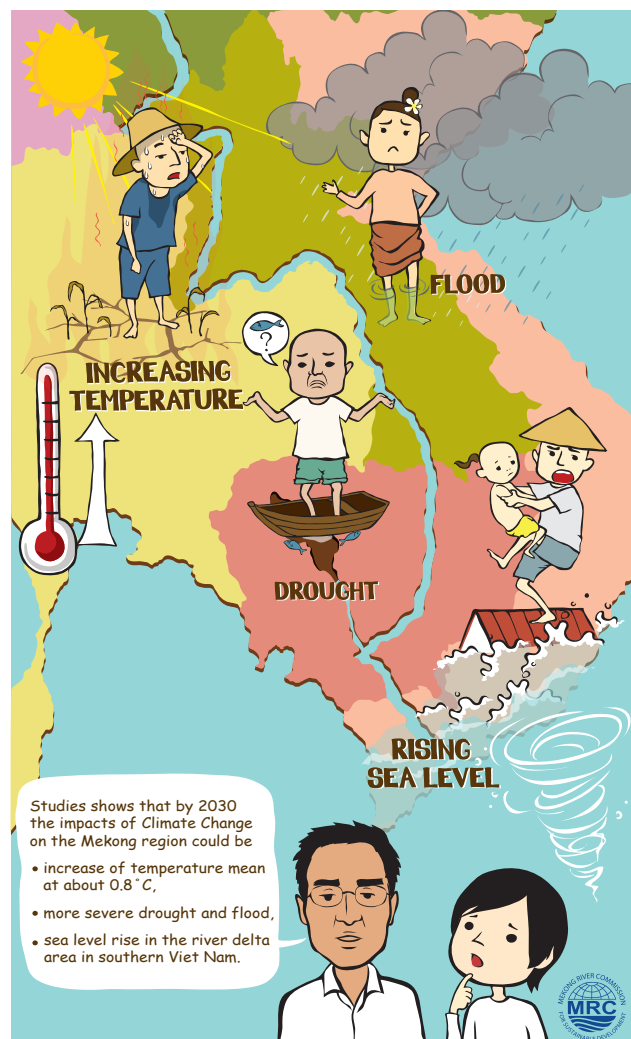


Figure 2. poster about Climate Change, Mekong River Commission, 2011

Extra information: Weather and Climate

Weather is the day-to-day state of the atmosphere in terms of temperature, moisture content and air movements. Weather can be directly perceived by people.

In contrast climate cannot be directly perceived by people. Climate is a scientific concept. It deals with statistics, such as averages of weather events, normally over a 30 year period.

Therefore climate change is not the difference in conditions we experience day-to-day or even year-to-year, rather it is the difference between average long-term conditions in an area.

Climate change could affect EVERYONE and EVERYTHING in the world.

Some of the changes could be good, but many of the changes could be bad!

Extra information: Predicting climate change

Scientists use scientific and mathematical computer models to predict how the climate will change in the future. The models are very complex. Most are in fact a combination of smaller models for different parts of the Earth, such as:

- Atmosphere models: which predict air movement, temperature, clouds, and other atmospheric properties;
- Ocean models: which predict ocean temperature, salt content, and circulation of waters;
- Ice models: which predict ice cover on land and sea; and
- Vegetation models: which predict how vegetation will change and interact with the atmosphere.

Extra information: Measuring climate change

A good record of global temperatures has been kept since the early 1800s, when the modern scientific thermometer was first developed. Therefore, since this time we have a good understanding of what temperatures around the world have been like.

But how do we know what global temperatures were before this time?

Scientists have developed many ways to answer this question, including:

- Glaciers – glaciers are large bodies of ice which form in cold areas, such as mountains. Glaciers grow when temperatures are cold, and shrink when temperatures are hot. By studying how glaciers have grown and shrunk over time, scientists know when global temperatures have been cold and hot.
- Sea level changes – sea levels rise when the climate is hot, and get lower when it is cold. By studying sea level movements over time, scientists can tell you when it has been cold or hot.
- Ice cores – an ice core is a sample of ice which scientists have drilled out of a large sheet of ice, such as from the Arctic, Antarctica or glaciers. By studying the ice core scientists can tell when the ice has melted and grown and can therefore tell when global temperatures have been hot or cold. The study of gas trapped in bubbles in the ice also helps uncover what conditions were like previously.

- Tree rings – trees grow rings in their trunks each year, when the temperature is hot, rings are grown quicker (and are thicker), when it is cold they grow slower (and are thinner). Therefore, by studying tree rings, scientists can tell whether it was hot or cold over different times in history.
- Soil and sediments – soil and sediments trap animal and plant remains when they develop over time. As vegetation and the animals in an area change when the climate changes, based on what animal and plant remains are in soil/sediments, scientist can tell what the climate was like at that time in history.
- Pollen – some plants like hot weather, some like cold weather. By studying pollen that is found in ice cores or sediment, and discovering how old it is, scientists can tell which plant was most common at different times in history and therefore whether the climate was cold or hot.

1.2 What causes climate change?

The Earth has a layer of gases (known as greenhouse gases) in its atmosphere which trap heat (e.g. from sunlight) in and keep the planet warm. Human activities, such as burning petrol and deforestation, have increased the amount of greenhouse gases in the atmosphere. This has resulted in more heat being trapped in the Earth's atmosphere and the planet becoming warmer (see Figure 2).

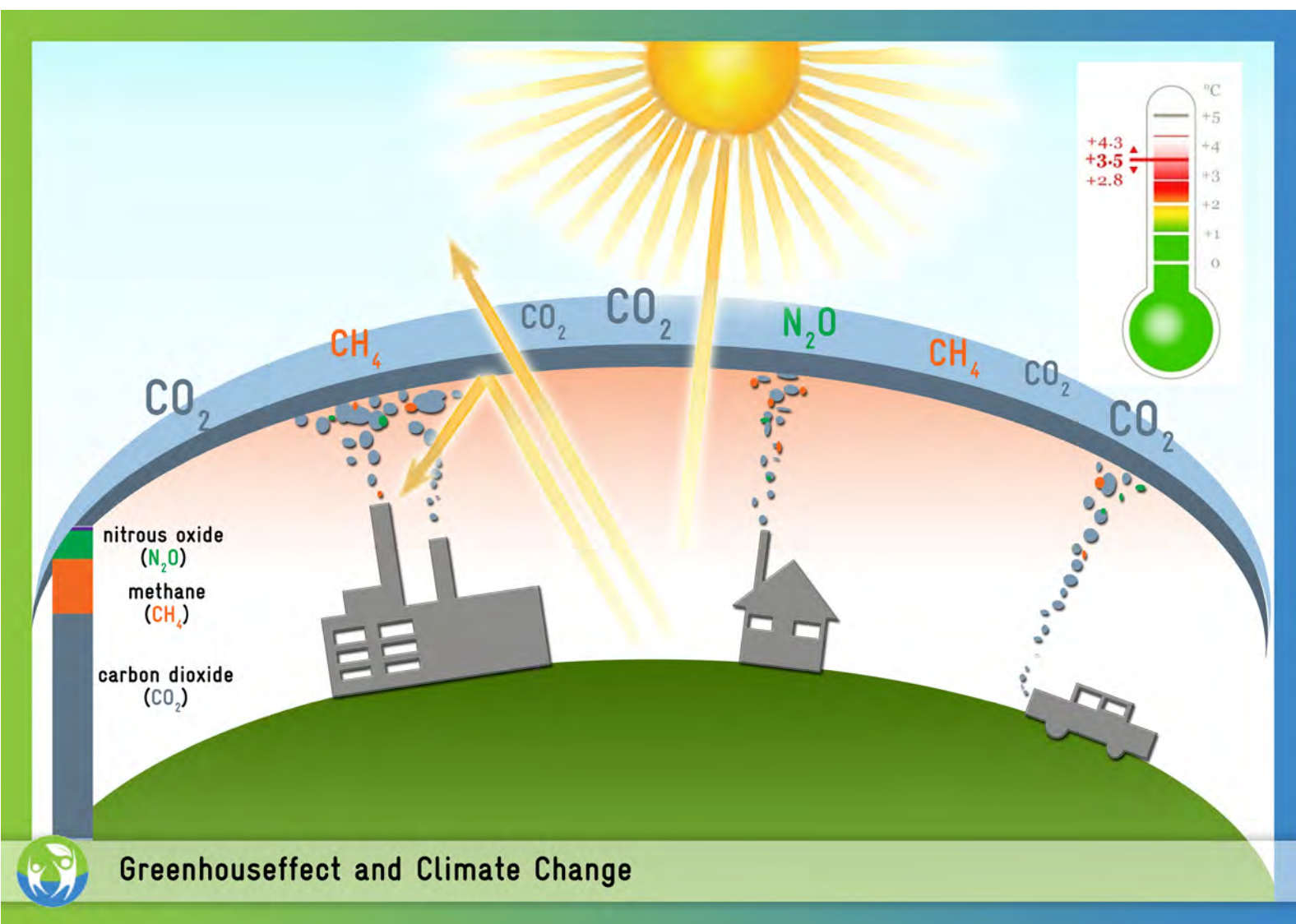


Figure 3. Greenhouse gas effect

1.2.1 Greenhouse gases

Greenhouse gases occur naturally in the atmosphere. Without greenhouse gases, the sun’s heat would immediately rebound off the Earth’s surface back into space leaving the planet very cold (potentially up to 33°C colder) (2).

The main greenhouse gases which are found in the atmosphere are:

- Water vapour (H2O);
- Carbon dioxide (CO2);
- Methane (CH4);
- Nitrous oxide (N2O); and
- Ozone (O3).

What is a Greenhouse?

In colder parts of the world, people use buildings (called greenhouses) to grow plants and vegetables. Greenhouses are usually made of glass which allows the heat and light in, but keeps out the cold.

The composition of greenhouse gases in the atmosphere has remained constant for a long time, creating stable conditions here on Earth which are perfect for life. However, human activities (particularly since the ‘Industrial Revolution’, or after 1750) have increased the amount of greenhouse gases in the atmosphere (see Table 1).

Gas	1750 Level	Current Level	Increase
Carbon dioxide (ppm)	280	390(3)	110
Methane (ppb)	715	1,774	1,059
Nitrous oxide (ppb)	270	319	49

(ppm = parts per million; ppb = parts per billion)

The more greenhouse gases in the atmosphere, the warmer the planet will become. A large rise in temperature could be terrible for us and for any living thing on Earth (see Lesson 2 for impacts of climate change).

How are greenhouse gases produced by humans?

The main greenhouse gases of concern in relation to human induced climate change are carbon dioxide, methane and nitrous oxide. Of these, carbon dioxide is considered to be the gas of most concern as it is the greenhouse gas released most by human activities.

1.2.1.1 Carbon Dioxide

Most of us know carbon dioxide (CO₂) from the human respiratory (breathing) process. Humans breathe in oxygen (O₂) and breathe out carbon dioxide, while plants do the opposite through photosynthesis, taking in carbon dioxide and releasing oxygen (which makes them important in terms of stopping climate change). We might also know carbon dioxide from fizzy drinks such as soft drinks (Coca, soda, 7up), as the bubbles in these drinks are actually CO₂ gas.

Carbon dioxide is released naturally into the atmosphere in large quantities through processes such as decay of organic matter, release from volcanic processes, or respiration (breathing) of living organisms. The same amount of carbon dioxide is removed naturally from the atmosphere through processes such as photosynthesis by plants and marine plankton, or weathering (breaking down) of rocks. As a result of this balance, the concentration of carbon dioxide in the atmosphere has remained stable for the past 650,000 years (i.e. between 180-300 ppm) (1).

However human activities have upset this balance, and carbon dioxide concentrations in the atmosphere have increased (climbing up to 390 ppm in 2010)(3). The main human activities which lead to the release of carbon dioxide are:

- Burning of petrol/diesel in motorbikes, cars, buses, trucks and factories;
- Burning of other fuels such as coal and oil (which are burnt in power plants to make electricity) and wood;
- Cutting down of forests.

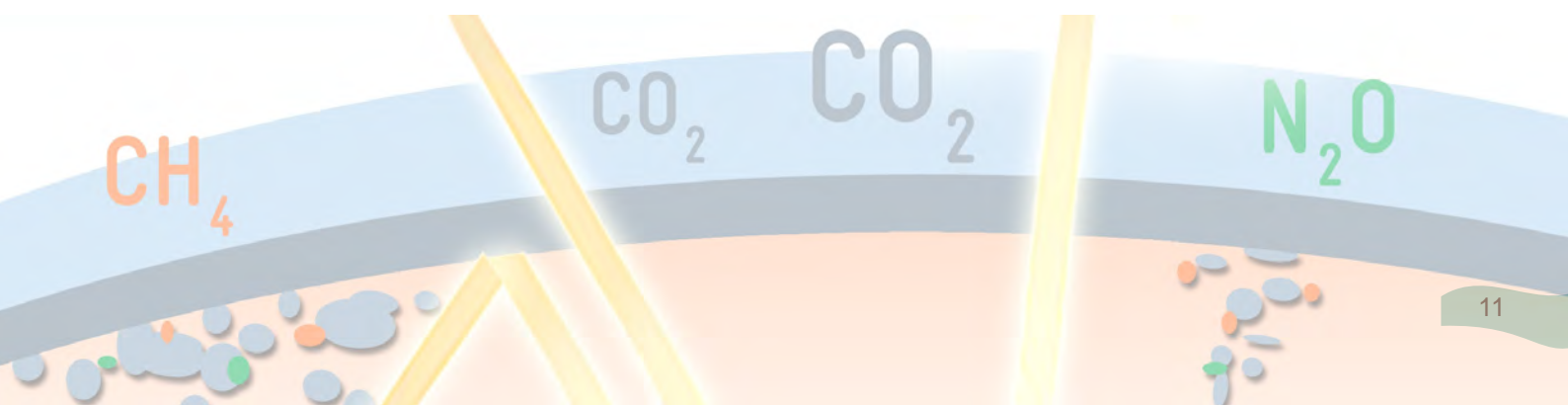
The burning of 'fossil fuels' (such as coal, oil, petrol, diesel and natural gas) is responsible for up to 75% of the carbon dioxide released by humans over the last 20 years(4).

Deforestation (or cutting down, burning or clearing of trees) is responsible for approximately 20% of carbon dioxide released by humans(5). Deforestation is occurring across the world, at a rate of up to 10 million hectares a year(5). When trees are cut down or burnt they release a lot of carbon dioxide into the atmosphere. If a large area of trees is cut down and never replanted the carbon dioxide stays in the atmosphere, which is why stopping deforestation is such an important activity.

1.2.1.2 Methane and nitrous oxide

Methane (CH₄) is released into the atmosphere from a wide variety of natural sources (mainly by wetlands) and human activities (such as fossil fuel drilling and production, burning of methane to produce energy, raising livestock and leakage from landfills). Methane naturally breaks down in the lower atmosphere, but human activities are producing more than what naturally breaks down. Methane concentrations in the atmosphere have increased approximately 148% since 1750 (see Table 1).

Nitrous oxide (N₂O) is released naturally into the atmosphere from oceans and soils (particularly tropical soils), where it breaks down naturally and is removed. Human activities, such as fertiliser application to soils, raising livestock and industrial factories, have increased concentrations of nitrous oxide in the atmosphere from 270 parts per billion (ppb) to 319 ppb since 1750 (see Table 1).



Extra information: Are all greenhouse gases equal?

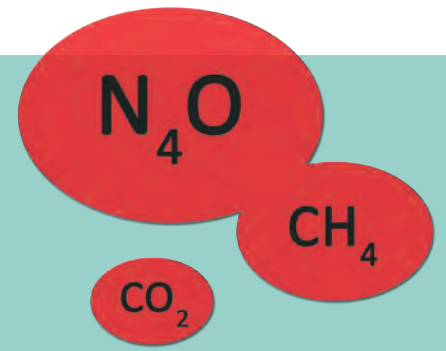
Some greenhouse gases are more dangerous than others because:

- Some gases can warm the planet more effectively than others;
- Some gases can survive in the atmosphere longer than others;
- Some gases can do both.

Consequently, scientists have rated the greenhouse gases to show how dangerous they are. This rating is called a 'global warming potential'. As carbon dioxide is the greenhouse gas released most by humans, it is used as a basis, and given a rating of 1.

Methane has a global warming potential rating of 25, which means it is 25 times more effective at warming the planet than carbon dioxide. This rating is also known as a 'CO₂ equivalent'. Nitrous oxide has a rating of 298.

Therefore, even though releases of methane and nitrous oxide are small compared to releases of carbon dioxide, just a small release of these gases can be dangerous in terms of climate change.



Lesson 2: Impacts of climate change

Overview: By the end of this lesson, students will have gained a basic knowledge about what are the impacts of climate change on the environment, including human society.

Objective: Students will

1. Examine the impacts of climate change on:
 - a) Sea levels;
 - b) The weather;
 - c) Agriculture;
 - d) Human health; and
 - e) Plants and animals.
2. Explore how climate change will affect their local area.

Prerequisite knowledge – Teacher

The 'Background Reading' below will give teachers an overview of the various impacts of climate change. 'Extra information' sections have been included as an additional resource for teachers in case they receive questions from students, or want to give their students additional information.

Prerequisite knowledge – Students

Students will need a basic understanding of climate change and its causes. This is covered in Lesson 1: Climate change – what is it and what causes it?

Potential activities

The Annex contains a list of activities that are designed to enhance students' understanding of climate change. Activities 3-8 may all be useful for Lesson 2.

Questions for students to answer

Upon completing this lesson, students should be able to answer the following questions:

1. What are some of the impacts that a rise in temperature could have globally?
2. Think about your local area. What impacts would climate change have on your local environment?
3. Examine Figure 3 and Table 2. What impact would a sea level rise of 1 metre have on your local town and your province?
4. In your opinion, what is the most serious impact of climate change for Viet Nam?

Lesson 2: Background Reading

2.1 Impacts of Climate Change

Increasing global temperatures due to climate change threaten to disturb many of the natural conditions and processes which exist on Earth. Average global temperatures are estimated to increase by another 2.5 degrees by 2070(6) and potentially up to 4.0°C by the end of this century(1). Average temperatures across Viet Nam are predicted to increase between 1.1–3.6 degrees by 2100 due to climate change, while in Southern Viet Nam the increase is predicted to be between 1.4–2.6 degrees(7). As temperatures rise many of the natural processes on Earth will be affected (such as atmospheric, weather and ocean processes), which could be devastating for humans, animals and plants. The sections below highlight some of the major impacts that climate change will have.

2.1.1 Sea level rise

As global temperatures continue to rise, ice in glaciers and around the Arctic and Antarctic will melt, releasing large amounts of water into the sea. As this large amount of water enters the sea, sea levels will rise, flooding low-lying coastal areas and islands around the world. Additionally, as temperatures rise, sea water will heat up and expand, making sea levels rise further.

Sea levels could rise by up to 1 metre by 2100(8), which would significantly impact many of the people who live in low-lying coastal areas. Some islands in the Pacific and in the Maldives could completely disappear. Low-lying cities, such as Singapore, London and New Orleans, will be significantly impacted by rising sea levels.

Many people around the world will have to leave their homes and land and large areas of farmland will be ruined due to rising sea levels. Land previously not prone to flooding will be flooded more often, which will put people who live on that land at risk.

A sea level rise of 1 metre is enough to displace at least 100 million people in Asia, mostly in Viet Nam, eastern China, and Bangladesh(8). One question governments have to face is: where will all these people go?

Most farming in South East Asia occurs on the low-lying coastal land that will be badly affected by rising sea levels.

Scientists predict that Viet Nam will be one of the countries most affected by climate change. Over the past 30 years, sea levels in Viet Nam have increased 5 cm(1). Sea levels are predicted to continually rise, increasing up to:

- 33 cm by 2050;
- 45 cm by 2070; and
- 1 m in 2100(9).

In Viet Nam, the Mekong Delta will be one of the worst affected areas due to sea level rise. If sea levels were to rise by 1 metre TODAY, potentially 12,376 km² of land and nearly 5 million people will be affected in 12 provinces in the Mekong(11) (see Table 2). In one single Province, for example Soc Trang Province, 43.7% of land would be flooded, which could affect approximately 458,000 people(11). Figure 3 shows the areas (in dark) of the Mekong that are currently less than 1 metre above sea level, and therefore may be flooded if sea levels were to rise by 1 metre.

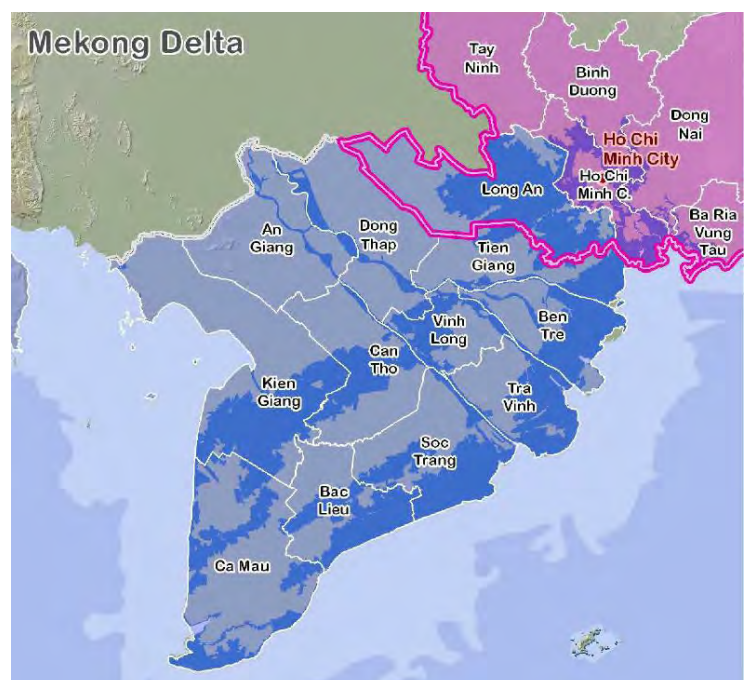


Figure 4. Areas of the Mekong Delta that would potentially be flooded if sea levels were to rise by 1 metre

Did you know?

- If Antarctica was to fully melt, sea levels would rise 60 metres(10).
- The area of sea covered by the Arctic ice has shrunk by 10% in recent decades, and the thickness of the ice above the water has decreased by about 40%(5).
- Two thirds of the world's cities (with over five million people) are located on low-lying coastal areas and will be affected by rising sea levels.

Province	Inundated area (km ²)	% of province area	Number of people affected	% of province population
An Giang	192	5.45	197,000	8.3
Bac Lieu	962	38.87	384,000	44.8
Ben Tre	1,131	50.14	759,000	54.6
Ca Mau	1,183	22.75	183,000	15.2
Can Tho	758	24.75	427,000	20.8
Dong Thap	389	11.53	222,000	13.4
Kien Giang	1,757	28.22	296,000	18.6
Long An	2,169	49.42	581,000	39.1
Soc Trang	1,425	43.71	458,000	35.0
Tien Giang	783	32.68	497,000	28.8
Tra Vinh	1,021	45.72	418,000	37.9
Vinh Long	606	39.69	364,000	31.6
Total	12,376	31.0	4,785,000	26.7

Table 2. Provinces of the Mekong Delta inundated were to rise by 1 metre ⁽¹¹⁾

Extra Information: The future might change

Both Diagram 2 and Table 2 show the impact that a 1 metre rise in sea level would have on the Mekong today. However, a 1 metre rise is not predicted to happen until 2100 and many things could change by then.

For example, the actions we take individually, as a nation and as an international community to reduce the amount of greenhouse gases we produce may reduce the impact of climate change and subsequently the amount of sea level rise.

Additionally, efforts to strengthen and raise coast protection dykes and to plant mangroves will also reduce the impacts of sea level rise.

2.1.2 Increase in severe weather events

It is predicted that rising global temperatures will change weather patterns around the world which will result in an increase in the amount of severe weather events such as storms, typhoons and droughts. Different parts of the world will experience different changes in weather patterns, some areas will experience more storms and hurricanes, some will have more droughts and heat waves (i.e. prolonged periods of excessively hot weather).

In the Mekong, climate change will mean an increase in rainfall during the rainy season – with more intense tropical storms, which will increase flooding in low lying coastal areas. Climate change will also mean an increase in the frequency and severity of droughts in the dry season.

2.1.3 Impact on agriculture

Rising sea levels and changing weather patterns will affect agricultural production around the world. Some areas, such as colder parts of the world, may actually become more productive as temperatures rise. However, a lot of agricultural land will become less productive as it will be:

- Flooded by sea water;
- Affected by drought;
- Local agricultural plants may no longer grow due to changes in weather or temperature;
- The availability of freshwater will be reduced.

The combination of more droughts and rising sea levels will increase salt water levels throughout the Mekong Delta and in its agricultural soils. This will have a negative impact on agricultural crops (such as rice) that need fresh water in order to grow.

Did you know?

Agricultural production around the world is predicted to drop 40% this century due to climate change(8). This would lead to many people suffering from hunger.

Figure 5. Impact of Climate Change



2.1.4 Impacts on human health

Climate change is set to have a significant impact on the health of humans around the world. Climate change will:

- Increase temperatures around the world which will increase the spread of tropical diseases such as malaria and dengue, as the mosquitoes that carry these diseases live in warm areas. It has been estimated that 5-6 billion people would be at risk from dengue by 2080 due to climate change (and population growth)⁽⁵⁾;
- Reduce freshwater supplies in some areas meaning that some people will not have water to drink or grow food with;
- Reduce agricultural production around the world leading to many people suffering from hunger;
- Increase the amount of severe weather events such as droughts, storms and heat waves. Severe weather events can be extremely detrimental to some people's health.

2.1.5 Impact on animals and plants

Many animals and plants on land and in oceans around the world will be impacted by climate change. It has taken millions of years for life to become used to the conditions on Earth and with climate change these conditions are set to change. As weather and temperatures change, the homes of plants and animals (i.e. their habitat) will be affected all over the world.

Many animals and plants may not be able to adapt to these rapid changes in habitat and could die. This could cause the permanent loss (extinction) of some animal and plant species from the world.



Figure 6 and 7 Effects of Climate Change on animals and human, Mekong Photo Contest, Bac Lieu 2010

Extra Information: Tipping point

Many scientists around the world believe that if climate change is allowed to continue, then there will be a point (tipping point) at which the effects of climate change will be irreversible, potentially catastrophic and will continue on, beyond human control. One theory is that because the ice in the Arctic and Antarctica helps keep the planet cool, if climate change melts these ice sources too much, they will not be able to cool the planet anymore and temperatures will continue to rise out of control.

Another theory revolves around ocean currents. Some ocean currents around the world are very important for keeping temperatures on the planet stable. If climate change continues then it might stop these currents, which would have a dramatic affect on temperatures around the world.

Most scientists agree that in order to ensure we do not reach the 'tipping point', we should not let global temperatures rise more than 2°C above 1750 levels (or 1.2°C above today's temperatures)^(8,12).

Lesson 3: How can we prevent climate change?

Overview: By the end of this lesson, students will have gained a basic knowledge about the different ways to help stop climate change.

Objective: Students will

1. Examine what the international community is doing to prevent global warming.
2. Explore different ways that they can help prevent climate change.

Prerequisite knowledge – Teacher

The 'Background Reading' below will give teachers an overview of what can be done to prevent climate change, including what we can do individually and what is being done internationally.

'Extra information' sections have been included as an additional resource for teachers in case they receive questions from students, or want to give their students additional information.

Prerequisite knowledge – Students

Students will need a basic understanding of climate change, its causes and its impacts. These are covered in Lesson 1: Climate change – what is it and what causes it? and Lesson 2: Impacts of climate change.

Potential activities

The Annex contains a list of activities that are designed to enhance students' understanding of climate change. Activity 9 is particularly relevant for Lesson 3, but activities 2-8 may also be useful.

Questions for students to answer

Upon completion of this lesson, students should be able to answer the following questions:

1. List some of the ways that governments are trying to prevent climate change.
2. What could you do in your daily life to help prevent climate change?

Lesson 3: Background Reading

3.1 How can we help prevent climate change?

3.1.1 The science

To ensure that temperatures remain at a safe level and do not rise 2°C above 1750 levels, we must reduce the amount of greenhouse gases emitted into the atmosphere by human activities. In order to stop climate change we need to reduce amount of greenhouse gases humans release by 80% compared to 1990 levels⁽⁸⁾.

3.1.2 What governments are doing

Many countries around the world are aiming to reduce the amount of greenhouse gases they release into the atmosphere through:

- Developing renewable, environmentally friendly energy sources – electricity is often produced through burning fossil fuels (such as coal). Many countries around the world are trying to develop ways to produce electricity that don't release greenhouse gases, such as by using wind, waves, dams, light from the sun and heat from the ground;
- Developing more energy efficient technology – electricity is used a lot around the world and producing it releases greenhouse gases. By developing technology (such as more energy efficient homes, offices, TVs, computers etc.) that uses as little electricity as possible, less greenhouse gases are emitted.
- Developing better public transport systems – when a lot of people travel in separate vehicles, a lot of greenhouse gases are produced. By developing better public transport systems (such as buses, trains, subways), people will use the same vehicle (not their own) which will release less greenhouse gases;
- Reducing deforestation (i.e. cutting down of trees) and increasing tree replanting. Trees remove carbon dioxide from the atmosphere, so the more trees planted the more CO₂ is removed from the atmosphere.

In Viet Nam, the Government has already started planning to reduce the impacts of climate change and sea level rise through strengthening and raising the heights of sea dykes and establishing mangrove forests in front of the sea dykes – as mangroves help reduce the impacts of waves and storms.

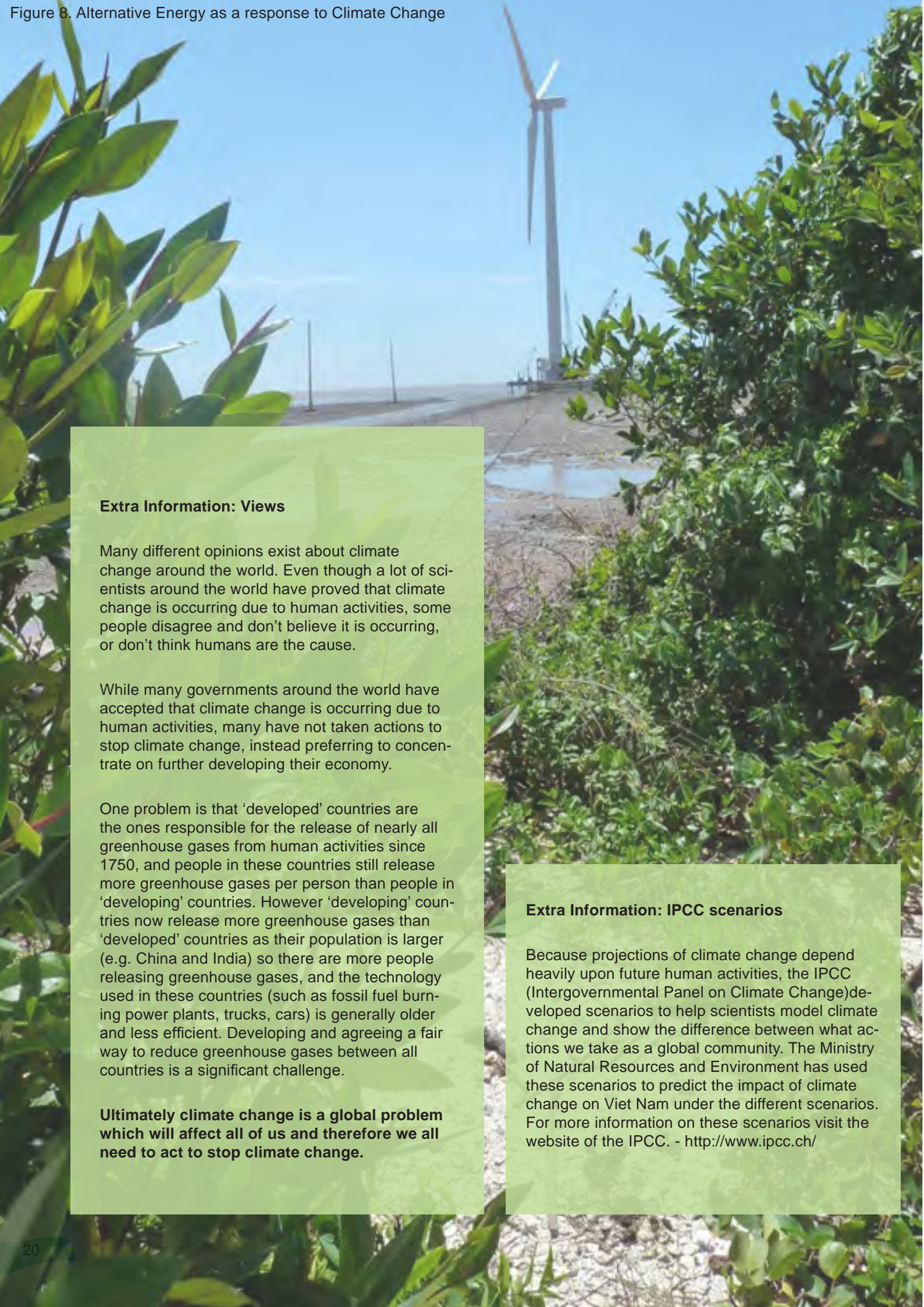
3.1.3 International Efforts

Internationally, governments from around the world have gathered together to develop solutions to stop climate change. Through one such meeting in 1997, the Kyoto Protocol was agreed upon by 184 countries (7 more countries have subsequently agreed to it). The Kyoto Protocol sets targets for reducing greenhouse gas emissions which countries have to meet.

An Intergovernmental Panel on Climate Change (IPCC) has also been set up to develop scientific information about human-induced climate change, its impacts, and possible ways to mitigate or adapt to it. The IPCC regularly publishes assessments about climate change, which many countries use to shape their policies on climate change.

In 2009 the Copenhagen Summit was held to further develop international efforts to reduce greenhouse gas emissions, while another international summit on climate change was planned for 2011.

Figure 8. Alternative Energy as a response to Climate Change



Extra Information: Views

Many different opinions exist about climate change around the world. Even though a lot of scientists around the world have proved that climate change is occurring due to human activities, some people disagree and don't believe it is occurring, or don't think humans are the cause.

While many governments around the world have accepted that climate change is occurring due to human activities, many have not taken actions to stop climate change, instead preferring to concentrate on further developing their economy.

One problem is that 'developed' countries are the ones responsible for the release of nearly all greenhouse gases from human activities since 1750, and people in these countries still release more greenhouse gases per person than people in 'developing' countries. However 'developing' countries now release more greenhouse gases than 'developed' countries as their population is larger (e.g. China and India) so there are more people releasing greenhouse gases, and the technology used in these countries (such as fossil fuel burning power plants, trucks, cars) is generally older and less efficient. Developing and agreeing a fair way to reduce greenhouse gases between all countries is a significant challenge.

Ultimately climate change is a global problem which will affect all of us and therefore we all need to act to stop climate change.

Extra Information: IPCC scenarios

Because projections of climate change depend heavily upon future human activities, the IPCC (Intergovernmental Panel on Climate Change) developed scenarios to help scientists model climate change and show the difference between what actions we take as a global community. The Ministry of Natural Resources and Environment has used these scenarios to predict the impact of climate change on Viet Nam under the different scenarios. For more information on these scenarios visit the website of the IPCC. - <http://www.ipcc.ch/>

3.1.4 What we can all do

We can all help prevent climate change through:

- Using less petrol – as using vehicles which burn fossil fuels produces greenhouse gases. Using the bus, a bicycle or walking are good alternatives when travelling short distances, while buses are also good for longer distances;
- Planting more trees and avoiding cutting down trees – as trees remove greenhouse gases from the atmosphere and when cut down they release greenhouse gases back into the atmosphere;
- Using as little electricity as possible – as often electricity is made from burning fossil fuels, which produces greenhouse gases;
- Recycling and reusing products – recycling means that less electricity is needed to make products, which reduces the amount of greenhouse gases produced;
- Using cloth bags instead of plastic bags – using cloth bags reduces the amount of electricity used in making plastic bags;
- Tell others – the more people we tell, the more we can prevent climate change.
- After charging your mobile phone etc. always unplug the charger from the socket to save energy.

The effect of climate change will depend on how well we can adapt and how much we can all do to reduce climate change around the world.

Figure 9. poster “What we can do..”, Mekong River Commission, 2011



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Annex

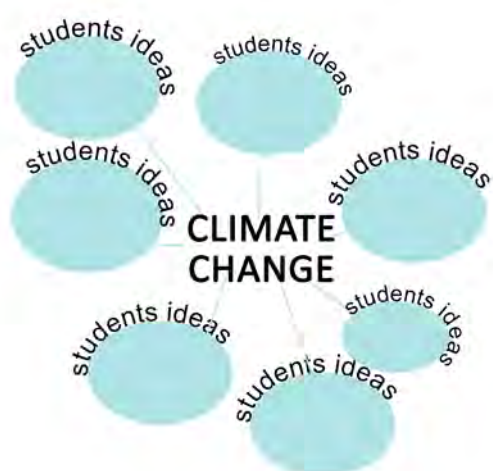
Annex: Potential Lesson Activities

This section contains a list of potential activities which could be included into lessons on climate change. The activities are designed to enhance students' understanding of climate change, its causes, impacts and methods of prevention.

Teachers should choose which activities they feel would best enhance their students' understanding of climate change. This list of activities is not exhaustive. Teachers should feel free to include other activities as they see necessary.

The activities correspond with the 3 lessons on climate change. Some activities correspond with certain lessons while other activities can be undertaken at any stage during the learning process.

Activity 1: Climate Change 'Mind-Bubble'



It is recommended that this activity be undertaken at the start of Lesson 1 as it will help teachers gauge what their students existing awareness of climate change is.

At the start of Lesson 1, ask students to write down what they know about climate change. Students could answer individually or as part of a small group. Write the term 'climate change' in a central bubble on a large piece of paper (or board). Ask students what they have written down, their answers should be summarised into key words or phrases and put into other bubbles surrounding the central bubble. The diagram on the following page shows how the Climate Change Mind Bubble could initially look.

The 'mind bubble' can be added to during the lesson, or during subsequent lessons and may be useful for students to visualise what they have learnt during the lesson(s).

Activity 2: Local stories

Get students to interview elders (e.g. parents, grandparents etc.) in their community about the local climate and environment and what changes they have seen over the years (e.g. changes in weather patterns, temperatures, vegetation, wildlife, fish size). Students can then make lists or write reports about what changes the elders have seen. The findings from the interviews can be shared during the next lesson. Findings could be listed on a board or piece of paper in front of the class. Students can then work together to identify which changes could have been caused by climate change.

Activity 3: Cloze exercise

On the following page is an extract from a speech delivered by the American President Barack Obama to a special United Nations summit on climate change in September 2009. Some words have been deleted from the speech. Students are to fill in the blank spaces in the speech using the words in the list below.

storms / sea levels / climate change / drought / threat / coastline / catastrophe / health

“Good morning. I want to thank the Secretary-General for organising this summit, and all the leaders who are participating. That so many of us are here today is a recognition that the threat from _____ is serious, it is urgent, and it is growing. Our generation’s response to this challenge will be judged by history, for if we fail to meet it – boldly, swiftly, and together – we risk consigning future generations to an irreversible _____.

No nation, however large or small, wealthy or poor, can escape the impact of climate change. Rising _____ threaten every _____. More powerful _____ and floods threaten every continent. More frequent _____ and crop failures breed hunger and conflict in places where hunger and conflict already thrive. On shrinking islands, families are already being forced to flee their homes as climate refugees. The security and stability of each nation and all peoples – our prosperity, our _____, our safety – are in jeopardy. And the time we have to reverse this tide is running out.

And yet, we can reverse it. John F. Kennedy once observed that “Our problems are man-made, therefore they may be solved by man.” It is true that for too many years, mankind has been slow to respond to or even recognise the magnitude of the climate _____. It is true of my own country as well. We recognise that. But this is a new day. It is a new era. And I am proud to say that the United States has done more to promote clean energy and reduce carbon pollution in the last eight months than at any other time in our history”.

Activity 4: True or false

Get students to identify if the following passages are true or false:

1. ‘Climate’ refers to the weather (e.g. temperatures, rain, sunshine, cloudiness, humidity and winds) patterns that an area experiences over a short period of time.
2. Temperatures are predicted to continually increase by another 1.8-4.0°C this century, and up to 6.4°C next century.
3. Human activities, such as burning petrol and deforestation, have increased the amount of green house gases in the atmosphere.
4. As a result of climate change, sea levels are predicted to rise by 7 metres by 2100.
5. The Mekong Delta would be one of the areas in Viet Nam least affected by sea level rise.
6. Tropical diseases, such as malaria and dengue, could become more common as a result of increase temperatures around the world.
7. If Antarctica was to fully melt, sea levels would rise 60 metres.
8. Increasing the amount of greenhouse gases emitted into the atmosphere by human activities will help prevent climate change.
9. Developing environmentally friendly energy sources and energy efficient technology will help prevent climate change.
10. I can help prevent climate change by using less petrol and recycling waste products.

Answers:

- | | | | | |
|----------|---------|----------|----------|----------|
| 1. False | 2. True | 3. True | 4. False | 5. False |
| 6. True | 7. True | 8. False | 9. True | 10. True |

Activity 5: Climate change in the news

Get students to collect articles from newspapers about climate change or events (e.g. floods/droughts) that could be related to climate change. Students can annotate the articles to highlight the main point of the article or to explain how the article could be related to climate change. Students could share what articles they collected with the class. The collected news articles could then be stuck to a classroom display board or in a classroom scrapbook for all students to see.

Activity 6: Climate change stories

Get students to write stories (fiction or non-fiction) that are related to climate change.

Activity 7: Climate change poster

Get students to design a poster about climate change. The poster could use words and pictures to raise awareness about climate change. The poster could then be displayed at your school.

Activity 8: Climate change art

Get students to create art works with a climate change theme.

Activity 9: Daily greenhouse gases and prevention plan

Get students to list all the activities they do which produce greenhouse gases (e.g. taking bus or motorcycle to school, using electricity at home or at school, eating food which has been transported to their home or school). Discuss in class what students could do differently to help reduce the amount of greenhouse gases they produce. Students could then develop a plan outlining what they will do differently in the future to help prevent climate change.



Figure 10 Reforestation of Mangroves to mitigate the negative impacts of Climate Change



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