VQA Level: 1

Learner Workbook

Certificate I in Climate Change and Disaster Risk Reduction

Units 4 and 5: CGCC0416 and CGCE0516

Demonstrate knowledge of the causes of climate change
Demonstrate knowledge of the effects of climate change

Learner: .....

Facilitator: .....

Date: .....

Before we start…

This Learner Workbook is designed to accompany the Learner Guide for the units of competency CGCC0416 and CGCE0516. It provides learner-centred activities and assessment tools to foster learning of key concepts and skills in these units, which form part of Certificate I in Climate Change and Disaster Risk Reduction. The competencies developed are line with the key competencies promoted by VQA to foster greater empowerment and success in the work place. Additionally, a Facilitator Guide for these units provides further background knowledge and teaching notes for facilitators, trainers and teachers.

This guide was designed to be used by a trained and accredited assessor who is registered to assess these specific unit standards as per the requirements of VQA. Prior to the delivery of the program the facilitator and assessor must familiarize themselves with the content of this Learner Workbook and the accompanying Learner Guide. The assessor, facilitator and learner must plan the assessment process together, in order to offer the learner the maximum support and the opportunity to display his/her competence.

This guide provides step-by-step instructions for the assessment process of:

Title: Demonstrate knowledge of the causes of climate change		
VQA Code: CGCC0416	**VQA Level**: 1	**Credits**: 3

Title: Demonstrate knowledge of the effects of climate change		
VQA Code: CGCE0516	**VQA Level**: 1	**Credits**: 3

These units are two of the building blocks in the qualification listed below:

Title	Code	VQA Level	Credits
Certificate 1 in Climate Change and Disaster Risk Reduction	……..	1 & 2	46

Activity 1.1a – Instruction to learner:

Pair work: short answer questions

In pairs, discuss the following questions and write your answers in the spaces provided:

1. Read pages 15-17 of your Learner Guide again. Then complete the blank spaces in this table (Fig. 1) to show examples of periods in the Earth's history when the climate was warmer or cooler than at present:

Fig. 1

Name of time period	How many years before today ?	Were temperatures warmer or cooler than today ?	Were sea levels higher or lower than today ?
Time when the Earth was formed			No oceans or seas. All water was in the form of water vapour.
Start of Carboniferous			
End of Carboniferous			
	49 million years ago	Much warmer	Much higher
Last glacial period during the recent Ice Age			
	125,000 years ago	Warmer	

2. Say whether each of these statements is TRUE or FALSE:
   a) Since the Earth began, atmospheric temperatures have become lower: _____
   b) In the Carboniferous period, plant growth was rapid because there was less oxygen in the atmosphere: _____
   c) In the Eocene epoch, it was much warmer because of the high levels of carbon dioxide and methane in the atmosphere: _____
   d) The most recent Ice Age started after humans had appeared on Earth: _____
   e) When atmospheric temperatures rise, sea levels become higher: _____
   f) The lower the atmospheric temperature, the greater the volume of ice on the planet: _____

Activity 1.1b – Instruction to learner:

Individual work: drawing two imaginative pictures

Imagine you were living in the north of Russia at the start of the Eocene epoch. Now create an imaginary picture of what the environment might have looked like. Then pretend that you were in the same place during a glacial period of the Pleistocene Ice Age. Draw a picture to show what the environment would have been like.

Activity 1.2a – Instruction to learner:

Drawing diagrams

In the top box below (Fig. 2), draw a simple diagram of the water cycle, showing evaporation, condensation, precipitation, transfer of vapour, infiltration, surface run-off and underground flow. In the bottom box (Fig. 3), draw a diagram to show what the water cycle would look like during a glacial period of the last Ice Age, when temperatures were much colder and precipitation fell down as snow. Add labels to your two diagrams.

Fig. 2

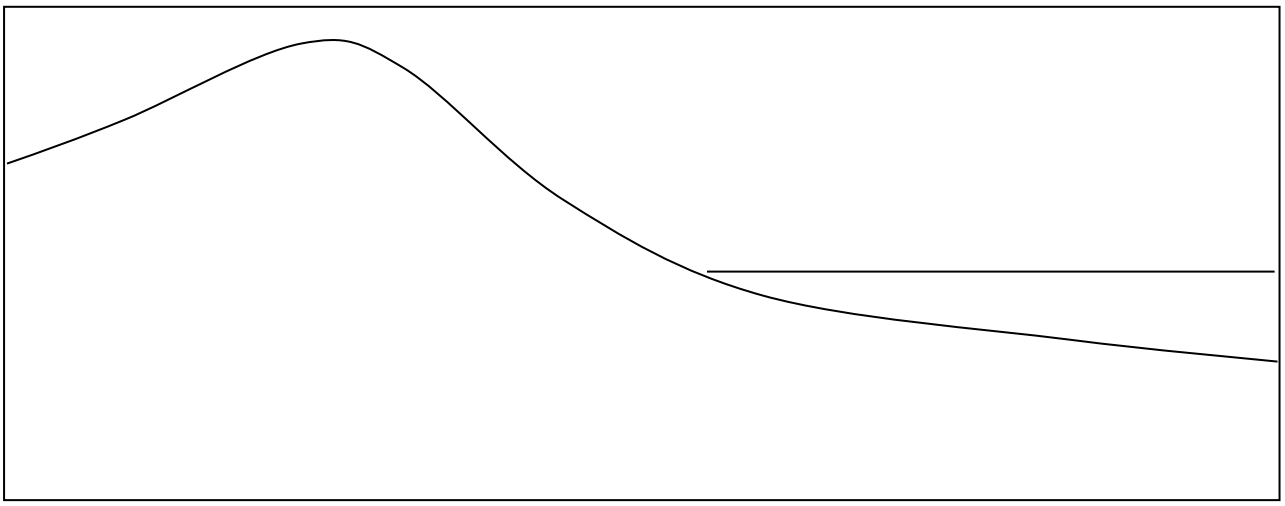
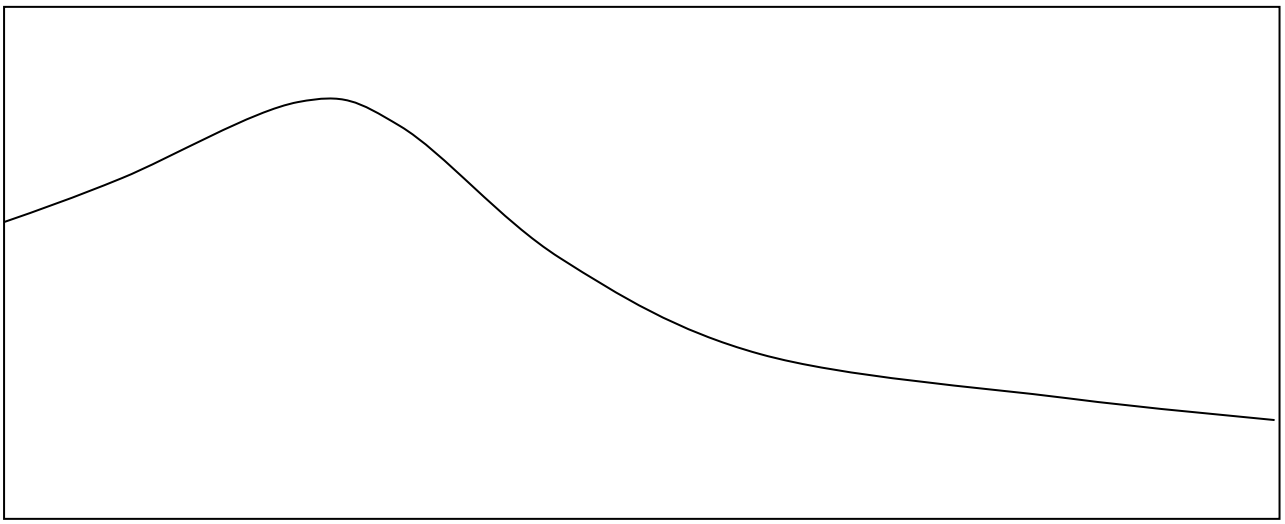


Fig. 3



Activity 1.2b – Instruction to learner:

"Carousel" activity on the Earth's changing climate

The class should divide into four groups, with four learners in each group. Each group should select one of the following topics:

1. Conditions during the Carboniferous period.
2. Conditions during the Eocene epoch
3. The Pleistocene Ice Age
4. Why sea levels went down all over the world during the Ice Age.

After choosing the topic, the group should prepare a large poster with pictures and information about each topic, and each member of the group should practice talking about the poster.

When groups are ready, they pin up their posters on the classroom wall and each group stands in front of its poster. The members of each group then give themselves a number from 1 to 4. The facilitator will now ask the number 1s from each group to leave their group and come and stand in front of the first poster, the number 2s from each group to stand in front of the second poster, all the number 3s to stand in front of the third poster and all the number 4s to stand in front of the fourth poster.

In each of the new groups, there will be one person who has prepared a talk on the poster that faces the group. He or she then talks about the poster. After 4-5 minutes, the facilitator will tell the groups to move to the next picture. Now another member of the new group will give the presentation. In this way, every person will have the chance to talk about his/her topic to a small group of fellow-trainees.

A carousel is something that goes round and round. This is a carousel activity because groups are moving around the classroom from one poster to another.

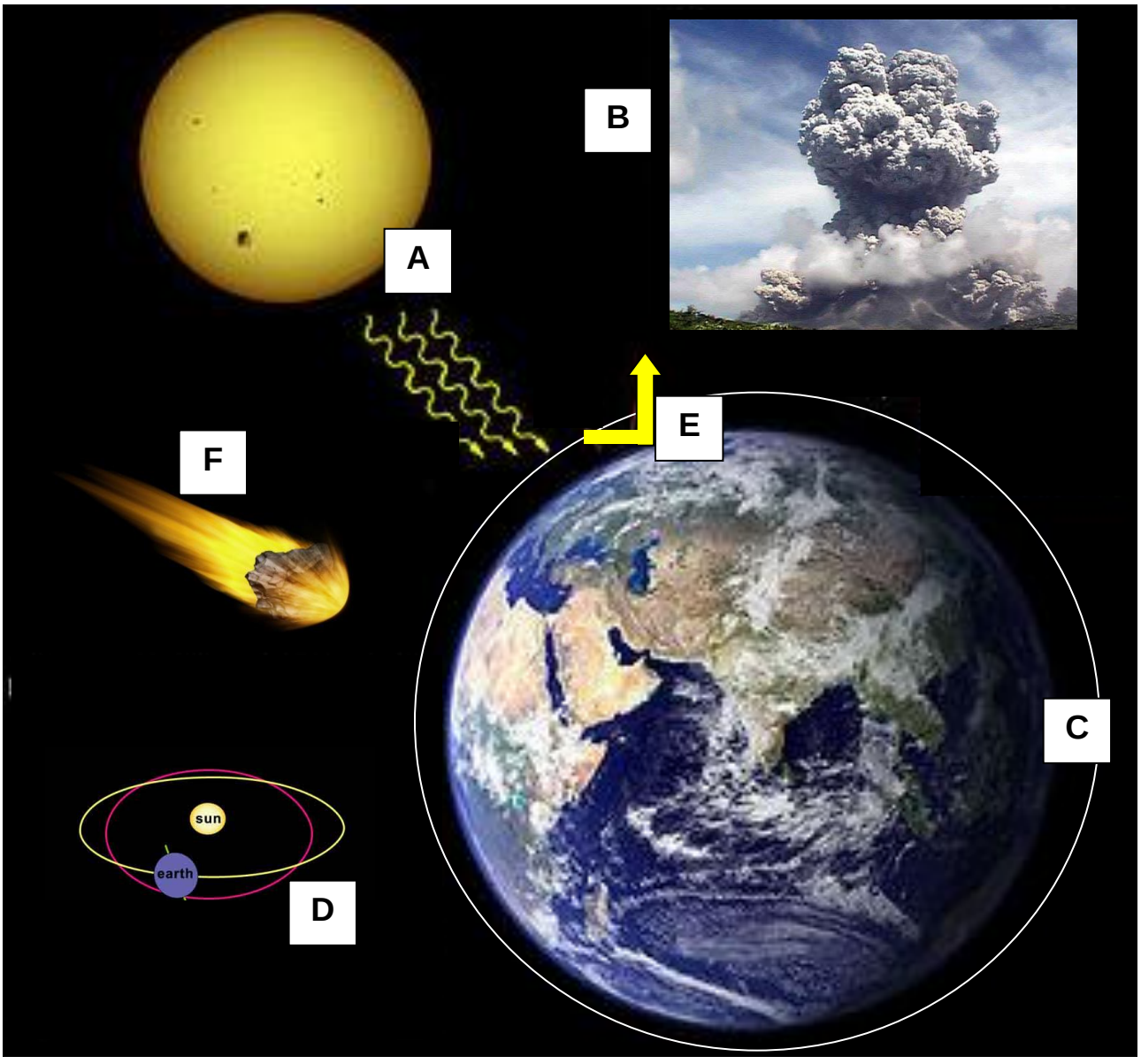
If by chance there are more than 16 persons in the class, then there can be five or more in each of the first groups that are formed. Then, instead of one person giving the talk, two people can share the presentation together. In other words, in each of the new groups that form, there might be two number 1s, two number 2s, but only one number 3 and one number 4.

Activity 2.1a – Instruction to learner:

Analysis of a diagram

In this diagram, some of the natural forcings of climate change are shown by the letters A to F. Put the correct code letters in the key below the diagram:

Fig. 4



Pierce, C., 2014

Changes in composition of the atmosphere		Changes in the Earth's orbit	
Meteorites and asteroids		Changes in Earth's albedo	
Changes in energy emitted by the Sun		Volcanic eruptions	

Activity 2.1b – Instruction to learner:

Pair work on natural forcings of climate change

1. In pairs, complete the table below (Fig. 5) to explain how and why Earth's climate has changed because of natural forcings or factors:

Fig. 5

Natural forcing	Does it make the climate warmer or cooler?	Why does it make the climate warmer or cooler?
Dust clouds emitted by volcanic eruptions		
Carbon dioxide and water vapour emitted by volcanic eruptions		
Increased solar radiation (more energy emitted by the Sun in solar flares, etc.)		
Earth's orbit becomes more elliptical		
More forest covers the earth		
More ice covers the earth		
More carbon dioxide and methane in the atmosphere		
Large meteorite hits the Earth		

2. Do you think that natural forcings or factors are playing a part in climate change today, and will continue to play a part in the future? Give a reason for your answer:

_____

_____

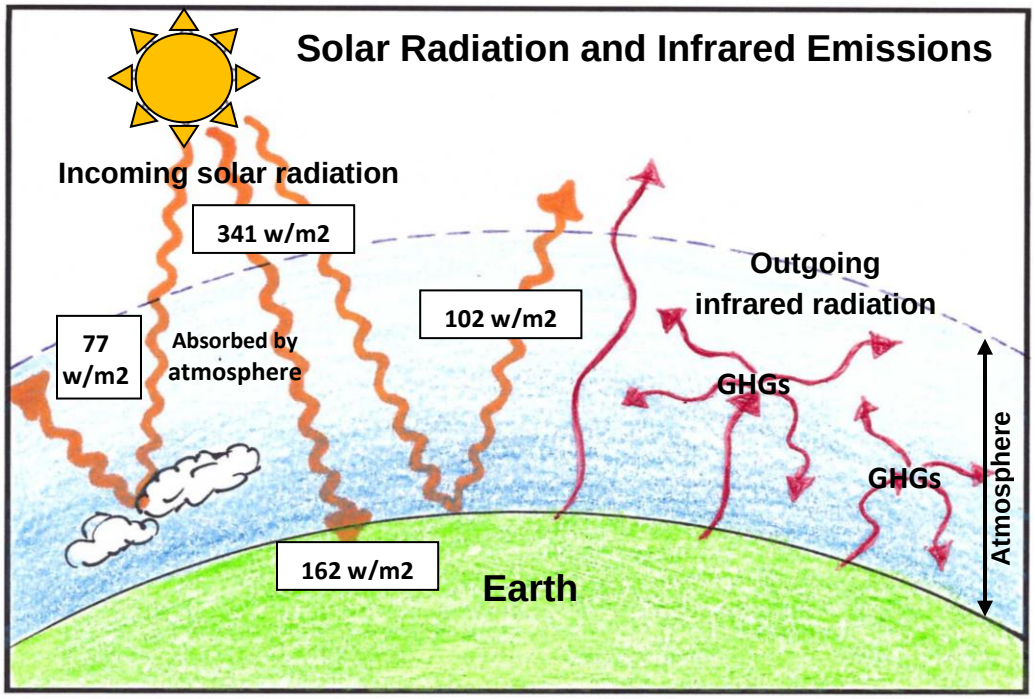
_____

Activity 3.1a – Instruction to learner:

Pair work - answering questions on a diagram

In pairs, study this diagram (Fig. 6), then answer the following questions:

Fig. 6



Pierce, C., 2014; NASA, 2014

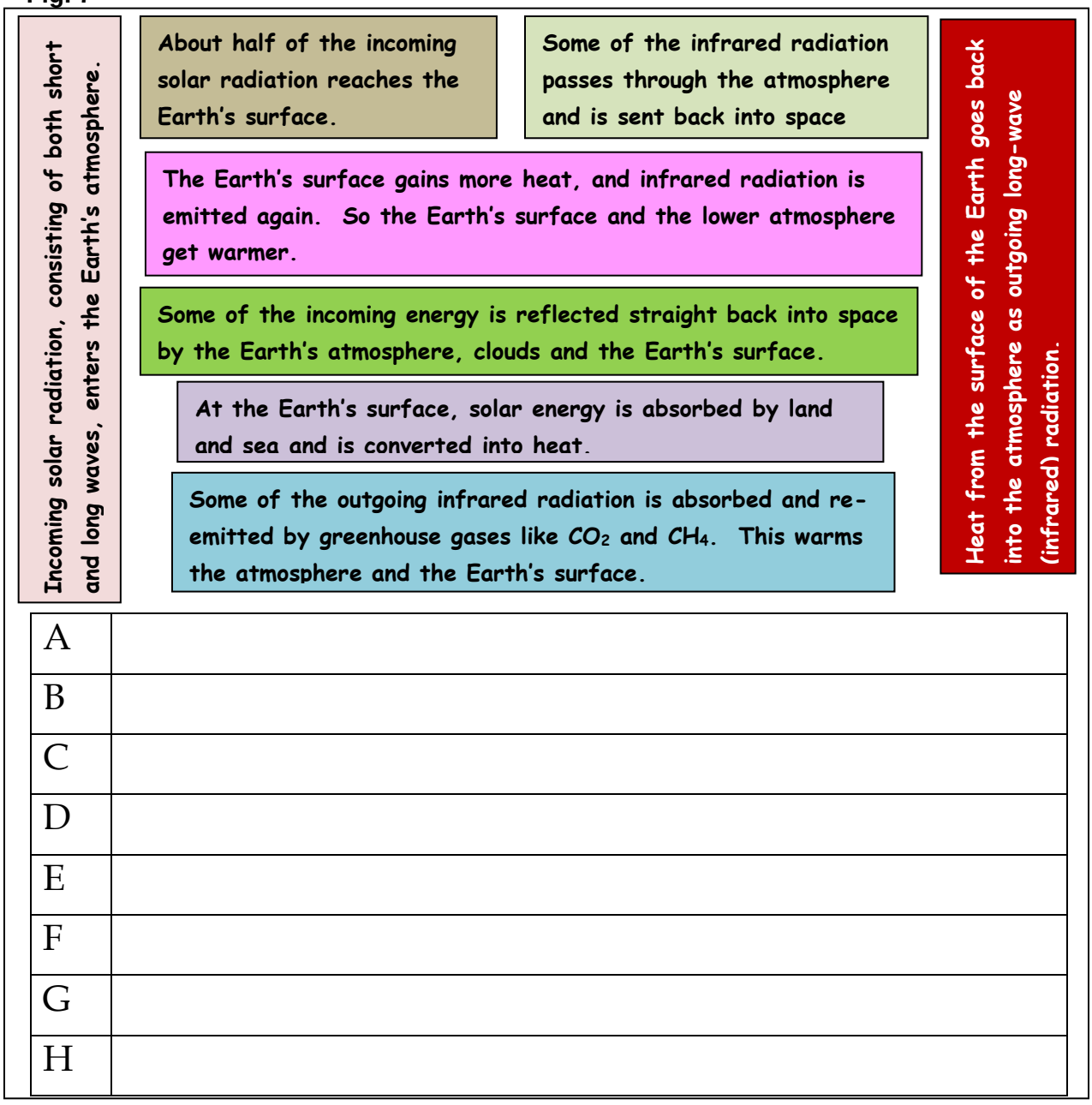
1. How much incoming energy from the Sun reaches our atmosphere? ……watts/m^2
2. How much of this incoming solar radiation is reflected by the atmosphere and the earth's surface? ……... watts/m^2
3. How much solar energy is absorbed by the Earth's surface (land and sea) and warms it up? ……. watts/m^2
4. What happens to the heat absorbed by the Earth's surface? ……. ……
5. How much energy is sent back from the Earth through the atmosphere and into space? …… watts/m^2
6. How would you describe the outgoing radiation from the Earth?.....
7. What happens to this outgoing radiation as it passes through the atmosphere? …… ……
8. Write the words GREENHOUSE EFFECT in the correct place on the diagram.

Activity 3.1b – Instruction to learner:

Giving a talk

1. You are going to give a talk to explain the natural greenhouse effect step by step. This box (Fig. 7) contains the different steps in the explanation, but they have not been shown in the correct order. Your first task is to sort them out and put them in the correct order in the spaces A to H below the box:

Fig. 7



A	
B	
C	
D	
E	
F	
G	
H	

2. Now copy this diagram (Fig. 8) on to a large piece of paper and add these labels:

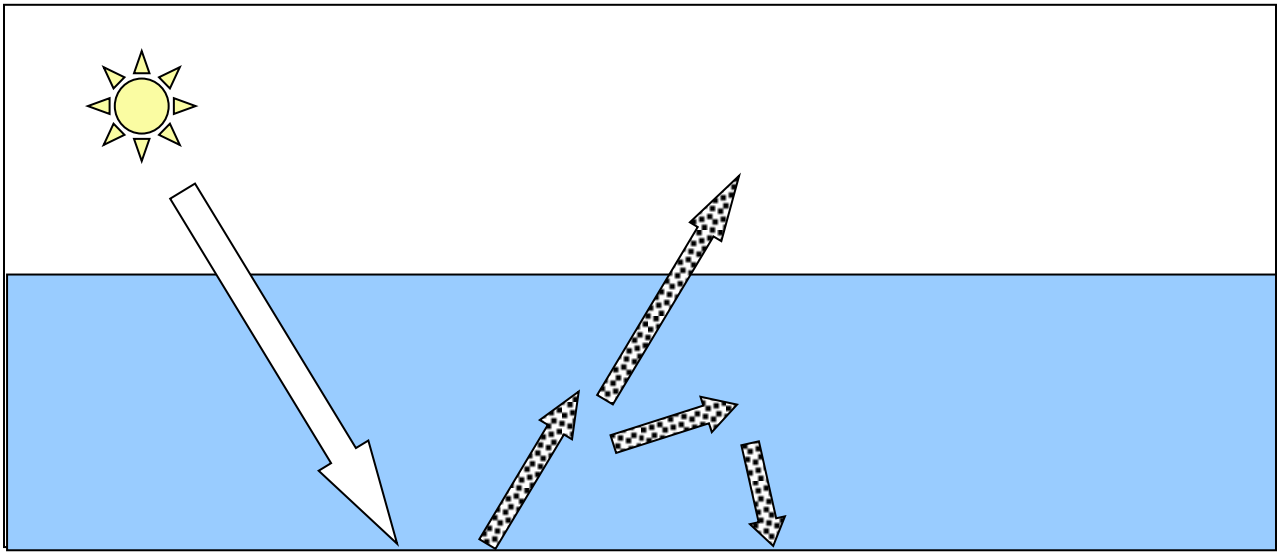
EARTH'S SURFACE

EARTH'S ATMOSPHERE

OUTGOING RADIATION FROM THE EARTH (LONG WAVE) IS TRAPPED BY GREENHOUSE GASES IN THE ATMOSPHERE, SO MAKING THE ATMOSPHERE WARMER

INCOMING SOLAR RADIATION (SHORT WAVE AND LONG WAVE)

Fig. 8



Pierce, C., 2014

You can then use your diagram to help you with your talk. You should memorize the steps you wrote down in no. 1 above. Then you can describe each step while at the same time pointing to the correct place and label on your diagram.

3. Now form pairs. Each should present to the other a step-by-step explanation of the natural greenhouse effect.

Activity 3.2 – Instruction to learner:

Individual exercise - True or False?

Say whether each of the following statements is TRUE or FALSE:

1. Carbon dioxide spends a longer time in the atmosphere than water vapour: _____
2. N_2O and CH_4 are mostly released into the atmosphere by natural causes: _____
3. Of all GHGs, CO_2 makes the greatest contribution to atmospheric warming: _____
4. CH_4 absorbs more out-going infrared radiation than CO_2: _____
5. Deforestation causes a build-up of carbon dioxide in the atmosphere: _____

Activity 4.1a – Instruction to learner:

Completion of a diagram

Complete this diagram (Fig. 9) to show how human activities are leading to the enhanced greenhouse effect. Firstly, add these labels in the correct place:

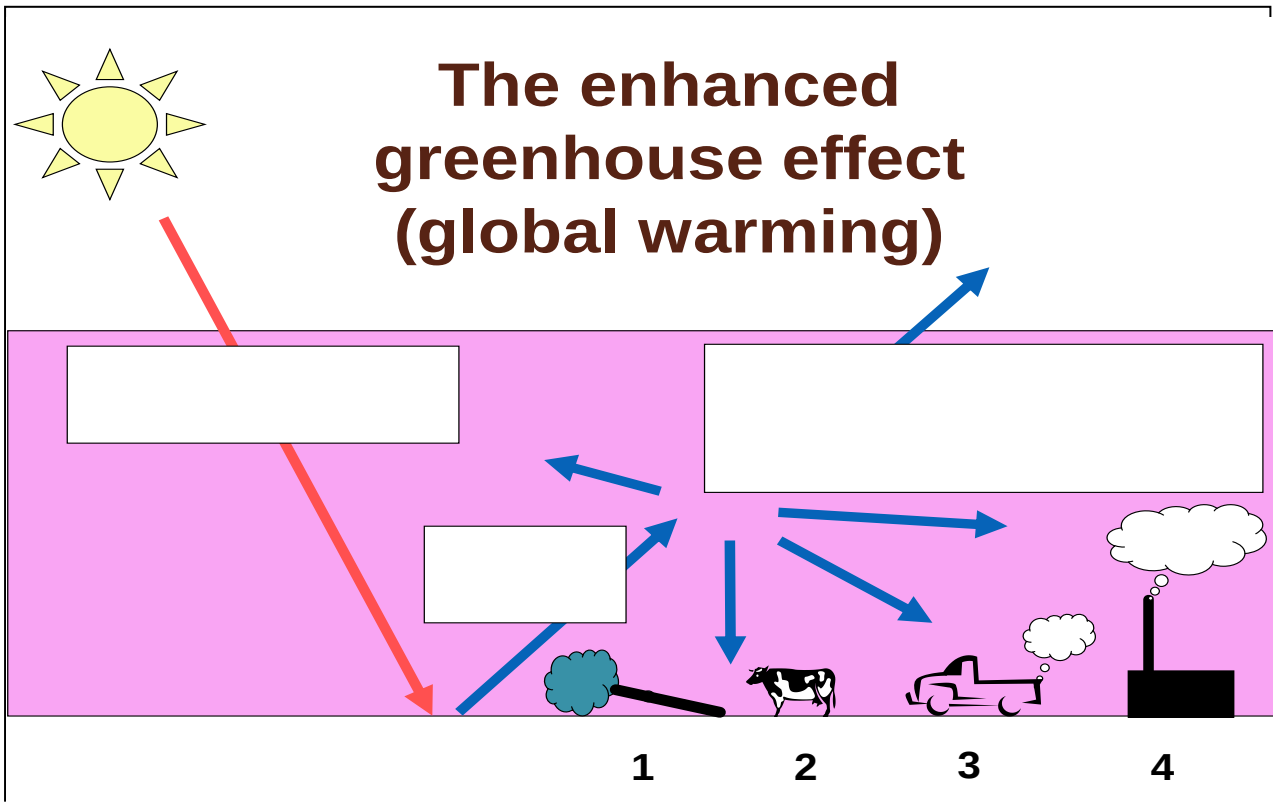
MORE GREENHOUSE GASES ARE PUT INTO THE ATMOSPHERE, SO TEMPERATURES INCREASE EVEN MORE

OUTGOING INFRARED RADIATION

Earth's surface

INCOMING SOLAR RADIATION

Fig. 9



the enhanced greenhouse effect:

1. _____

2. _____

3. _____

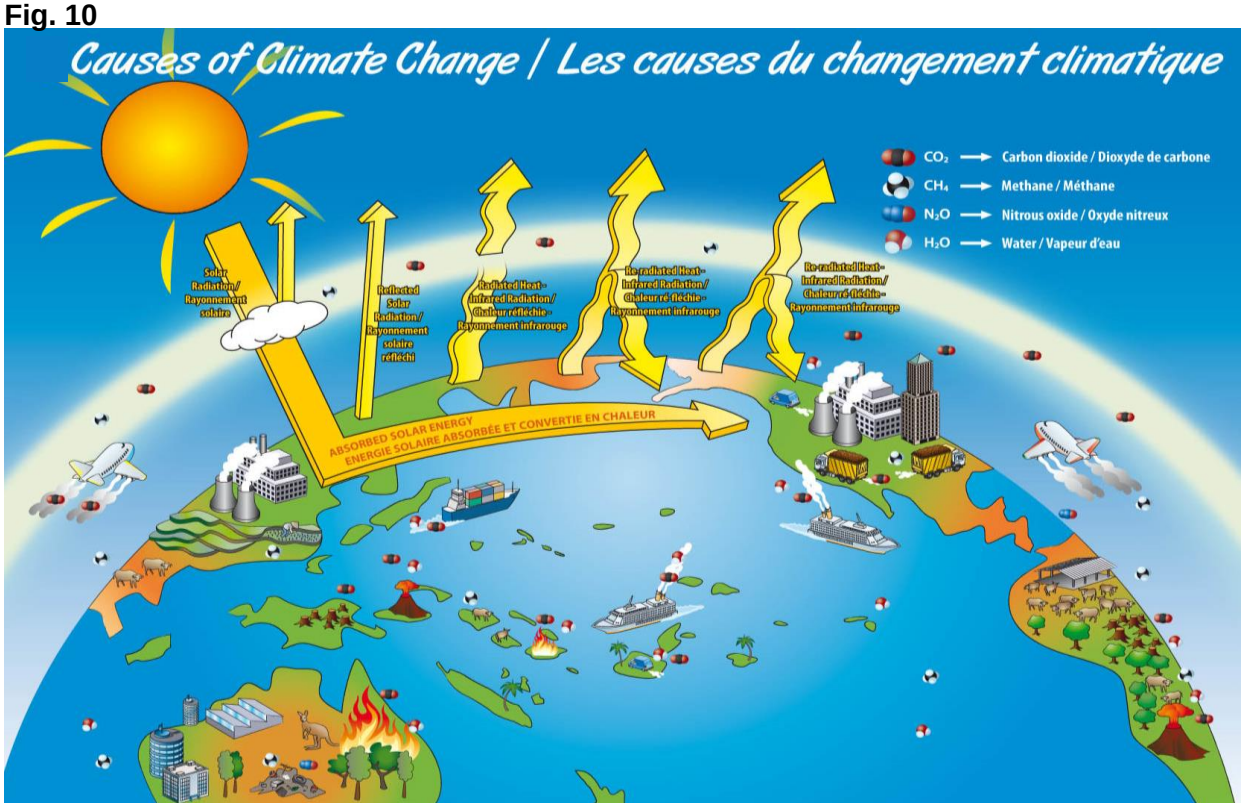
4. _____

Activity 4.1b – Instruction to learner:

Pair work - analysis of a picture

Study Fig. 10. It shows how natural factors and human activities are putting greenhouse gases into the atmosphere, so leading to the enhanced greenhouse effect and climate change. Work with a friend to answer the questions below the picture:

Fig. 10



SPC & GIZ, 2014: *A visual guide*

1. Find the two arrows that show the enhanced greenhouse effect. Label them EGE.

2. Name <u>two</u> natural causes of climate change shown in the picture: _____
   _____

3. Name <u>six</u> human activities shown in the picture that are contributing to climate change: _____
   _____
   _____

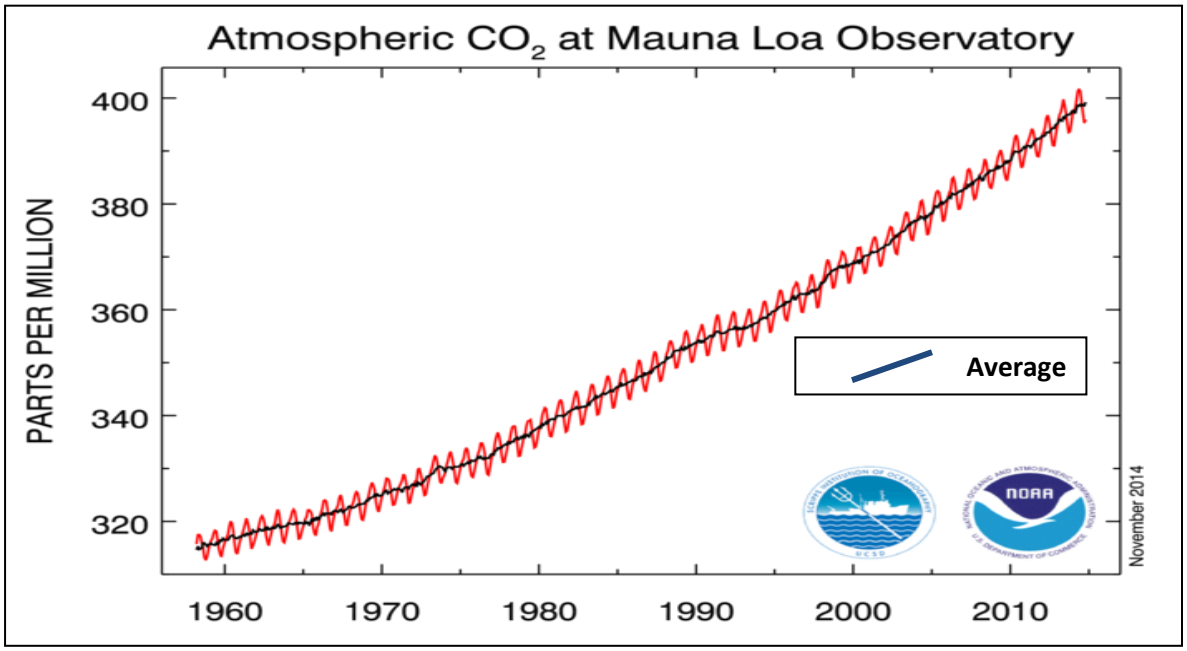
4. Which parts of the world are contributing most of the greenhouse gas emissions - industrialized, richer countries <u>or</u> poorer, less developed countries?
   _____

Activity 4.1c – Instruction to learner:

Discussion questions - either for the whole class or in small groups

1. This graph (Fig. 11) shows measurements of the carbon dioxide content of the atmosphere that were taken from the meteorological observatory on top of Mauna Loa in Hawaii. Why do you think the amount of carbon dioxide fluctuates each year? What is the general trend shown? Why is this happening?

Fig. 11



2. Which parts of the world do you think are suffering the most from the effects of the enhanced greenhouse effect (global warming)? Why do you say this?

3. Study this picture (Fig. 12), which shows a part of a village on Mota island, Vanuatu. Then suggest ways in which people in this village could be making small contributions to the enhanced greenhouse effect.

a) _____
_____
_____

b) _____
_____
_____

c) _____
_____
_____
_____

d) _____
_____

Fig. 12

Pierce, C., 2013

4. In your local community, what are the main sources of energy for cooking, lighting and transport? Do they come from fossil fuel? Is firewood important? Are they contributing to the enhanced greenhouse effect? Complete this table (Fig. 13):

Fig. 13

Purpose	Source of energy	When it is used or burnt, is it emitting CO_2?
Cooking		
Lighting		
Refrigeration		
Transport		
Other purposes *(State them here)* ……..		

Activity 4.2 – Instruction to learner:

Field investigation in small groups

Divide into small groups. Each group should undertake fieldwork in a different local community, or in different parts of the same local community. Your task is to observe all the ways in which people may be contributing to the enhanced greenhouse effect (global warming), and therefore to climate change. You should complete the questionnaire below (Fig. 14) , and also draw a sketch map of your area to show where the different activities are taking place. For example, you could record all the open piles of rubbish that you see. Don't forget to visit people's food gardens.

Fig. 14

QUESTIONNAIRE ON HUMAN ACTIVITIES AND GLOBAL WARMING

Names of observers: ……

Name of community: …… Island: ……

Walk around this community for 1-2 hours. Observe houses, gardens and other spaces.

1. Count the number of open piles of rubbish that you see. How many? ☐
2. Count the number of vehicles that you see, or that go past you, during the period of your survey. How many? ☐
3. Write down all the ways in which people in this community are contributing to the enhanced greenhouse effect and climate change. Think of food preparation, the burning of fossil fuels and firewood, preparation of gardens, animal rearing, deforestation, fires, waste disposal, methods of transport, etc.

Activity	This is contributing to an increase of which GHG?
Cooking with firewood	

4. Show examples of the above activities on your sketch map of the community.

Draw a sketch map of your village in this space. Show examples of the activities you named in question 3 of your questionnaire.

When you have completed your survey, discuss your findings with the other groups.

Activity 5.1a – Instruction to learner:

Paragraph writing

After discussing the differences between the natural greenhouse effect and the enhanced greenhouse effect with your fellow learners, please write two paragraphs to explain two of these differences:.

1. _____
_____
_____
_____
_____
_____
_____

2. _____
_____
_____
_____
_____
_____
_____

Activity 5.1b – Instruction to learner:

Talk on the causes of climate change

Now, each learner should prepare a short talk (5-10 minutes long) on the causes of climate change, both natural and human. You can make use of the picture on page 13 of this Learner Workbook, or else draw your own pictures. Discuss with your facilitator whether you will give your talk to a group of people from your training institution or to a group of people in the local community.

Activity 6.1a – Instruction to learner:

Short answer questions

1. If someone asks you to provide evidence that the carbon dioxide content of the atmosphere is increasing, what will you say? _____
   _____
   _____
   _____

2. According to readings from the observatory at Mauna Loa, what was the carbon dioxide content of the atmosphere in parts per million by volume in 1960? _____
   What was the CO_2 content in parts per million by volume in 2014? _____

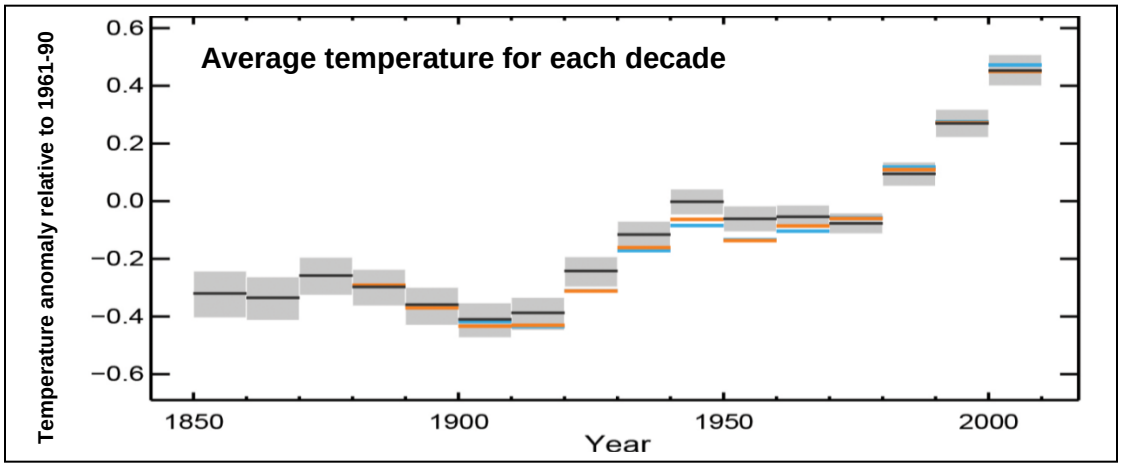
3. Why do atmospheric levels of carbon dioxide fluctuate during each year? _____
   _____
   _____
   _____

Activity 6.1b – Instruction to learner:

Small group work - analysis of graphs

1. In pairs or groups of three, study this graph (Fig. 15) , then answer the questions below:

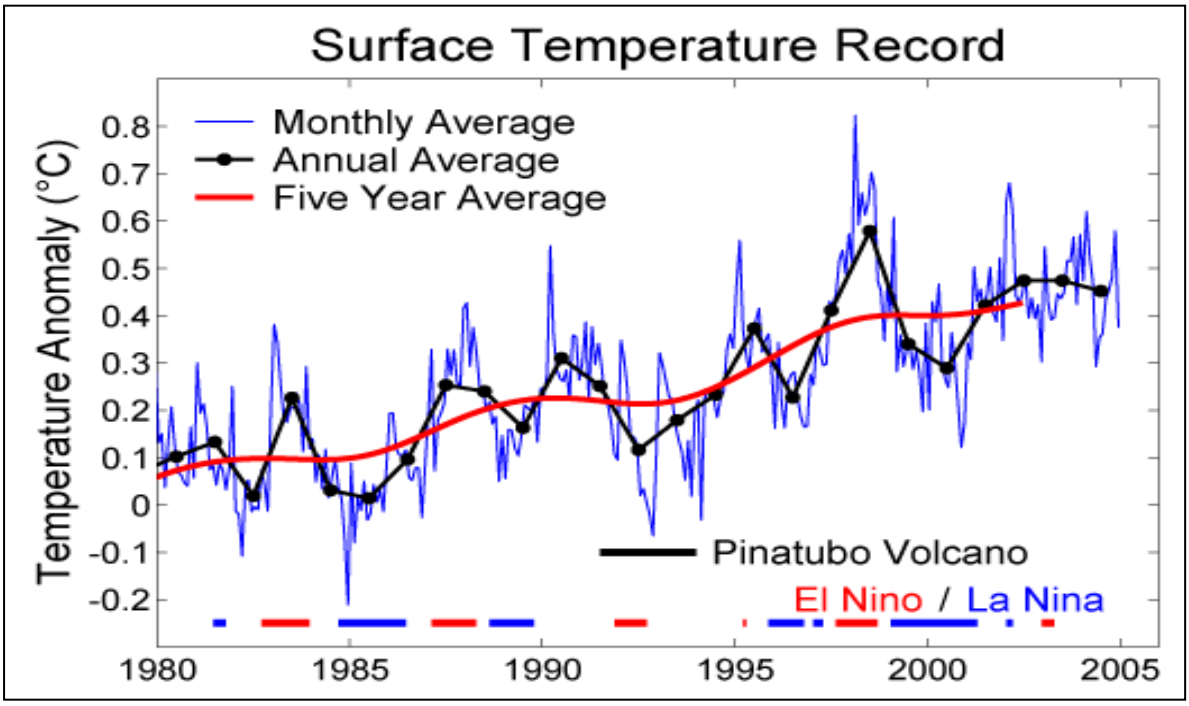
Fig. 15



a) How much lower was the temperature between 1850-1860 than in 1961-90? _____ °C
b) How much higher was the temperature between 2000-2010 than in 1961-90? _____°C
c) What do you learn from this graph? _____

2. This graph (Fig. 16) shows global surface temperature change for the period 1980 to 2004. The figures on the vertical axis show temperatures as compared with what they were in 1980. In groups of three, study this graph, then answer the questions below:

Fig. 16



Wheeling Jesuit University / Centre for Educational Technologies, 1999-2014

a) Look at the red line. In the year 2000, how much higher were temperatures than they had been in 1980? _____

b) Look at the black line and the blue line. What happened to global temperatures after the eruption of Pinatubo in 1992 ? _____
Why did this happen? _____

c) Look at the thick horizontal red and blue lines that indicate El Niño (red) and La Niña (blue) periods. Then look at the black line that shows world annual average temperatures. What were world temperatures like during an El Niño period?
_____

d) What were world temperatures like during a La Niña period? _____

e) In general, what happened to global temperatures between 1980 and 2005? _____
_____

f) Do you think that this change in temperature is related to an increase in the carbon dioxide content of the atmosphere during this same period? _____

g) Did the sea surface temperature decrease or increase from 1980 to 2005? _____

h) What happened to global sea levels during this period? _____

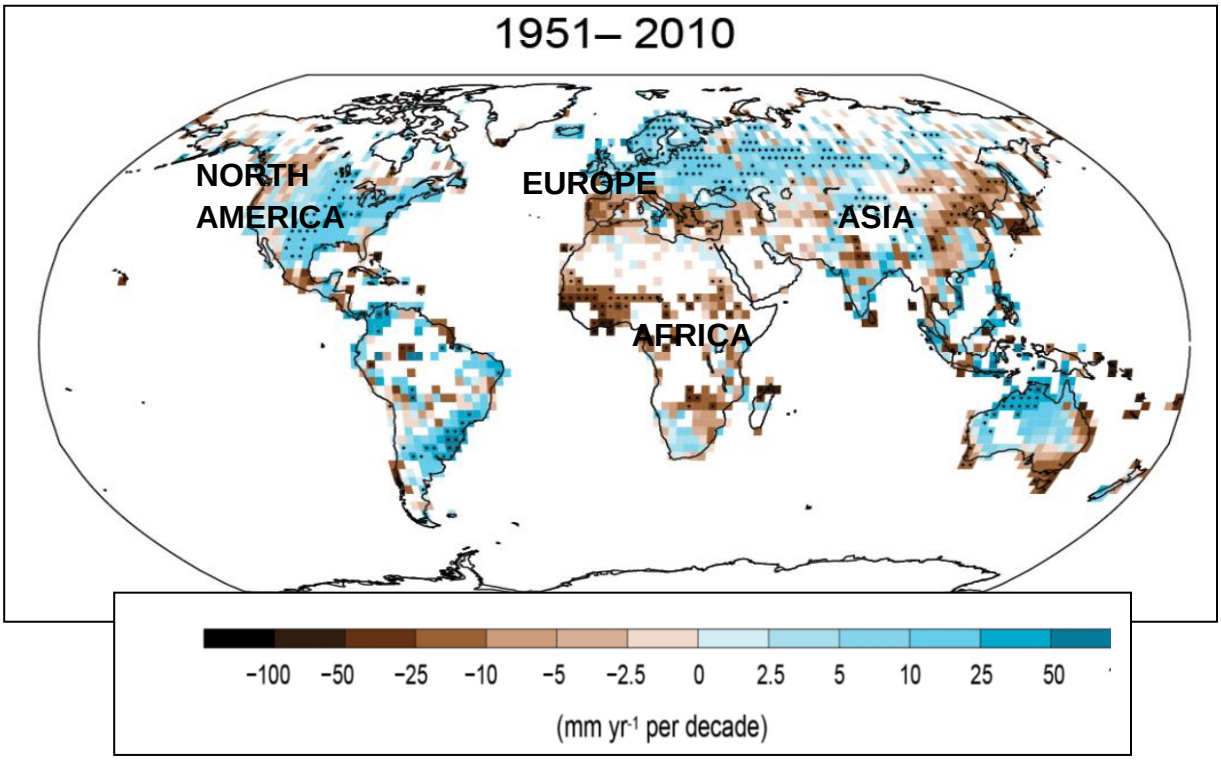
i) What happened to extent of ice in the world during this period? _____

Activity 6.2a – Instruction to learner:

Map work

This map (Fig. 17) shows how the total rainfall per year has changed around the world between 1951 and 2010. The darkest blue colour means that an increase of over 50 mm per decade has been recorded. The darkest brown colour means that a decrease of over 100 mm per decade has been recorded. Study the map, then answer the questions below:

Fig. 17



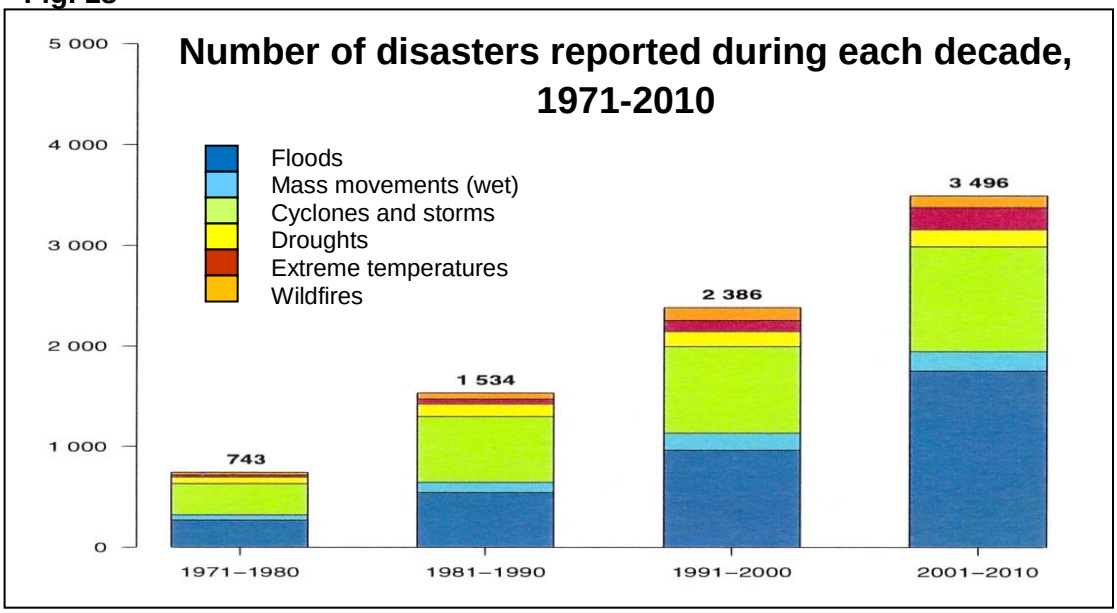
1. Has Africa become generally drier or wetter in the period 1951-2010? _____
2. Has North America become generally drier or wetter in the period 1951-2010? _____
3. Has northern Europe become drier or wetter in the period 1951-2010? _____
4. What has happened in Australia? _____
   _____
5. Which parts of Asia have become drier? _____
   _____
6. Does this map show that global warming is bringing more rainfall? _____

Activity 6.2b – Instruction to learner:

True or False?

Fig. 18 shows the number of disasters resulting from extreme weather events during each decade between 1971 and 2010, as reported by the World Meteorological Organisation. Use this graph and your own knowledge to say whether the statements below are TRUE (T) or FALSE (F):

Fig. 18



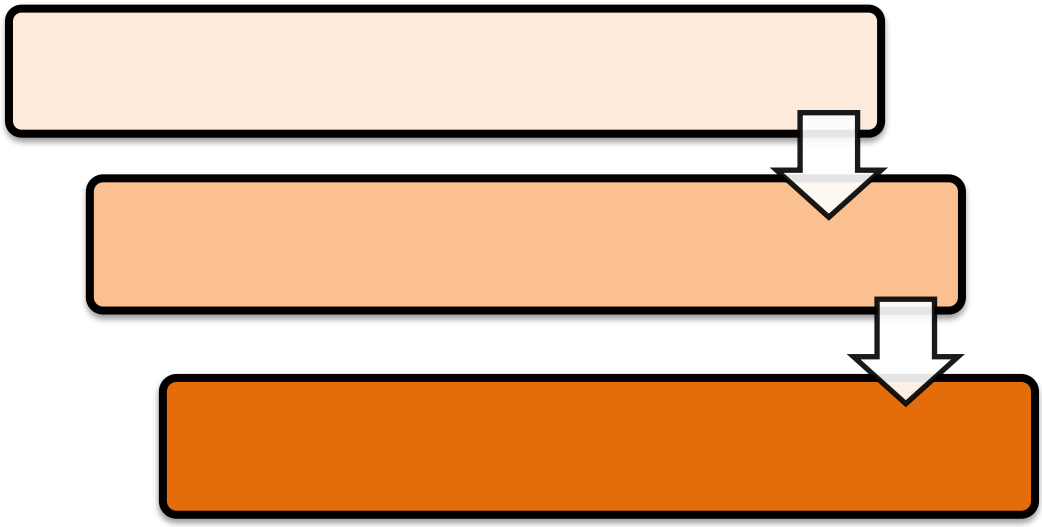
1. Extreme weather events include cyclones, storms, droughts and earthquakes: ____
2. Extreme weather events include very high temperatures and very wet weather: ____
3. Between 1971 and 1980, less than 1000 disasters were reported: ____
4. Between 1971 and 2010, there has been a decrease in the number of extreme weather events : ____
5. Most disaster events between 2001 and 2010 were cyclones and storms: ____
6. Disasters resulting from landslides are becoming more frequent: ____
7. The number of extreme weather events is rising every decade: ____
8. The increase in disasters is linked to global warming and climate change: ____
9. The increase in extreme weather events is a cause of climate change: ____
10. We are experiencing more and more extreme weather events because of increasing emissions of greenhouse gases: ____

Activity 6.2c – Instruction to learner:

Diagram completion

Look again at page 40 of your Learner Guide. Then complete this flow chart (Fig. 19) to show how increased emissions of greenhouse gases are leading to climate change:

Fig. 19



Activity 7.1a – Instruction to learner:

Paragraph writing

Write a few sentences to explain what is happening in this picture (Fig. 20):

_____

_____

_____

_____

_____

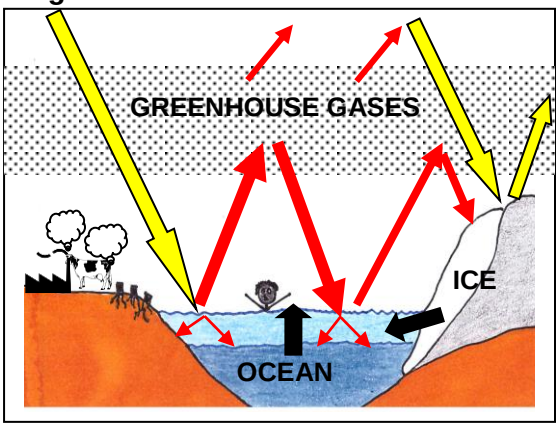
_____

_____

_____

_____

Fig. 20



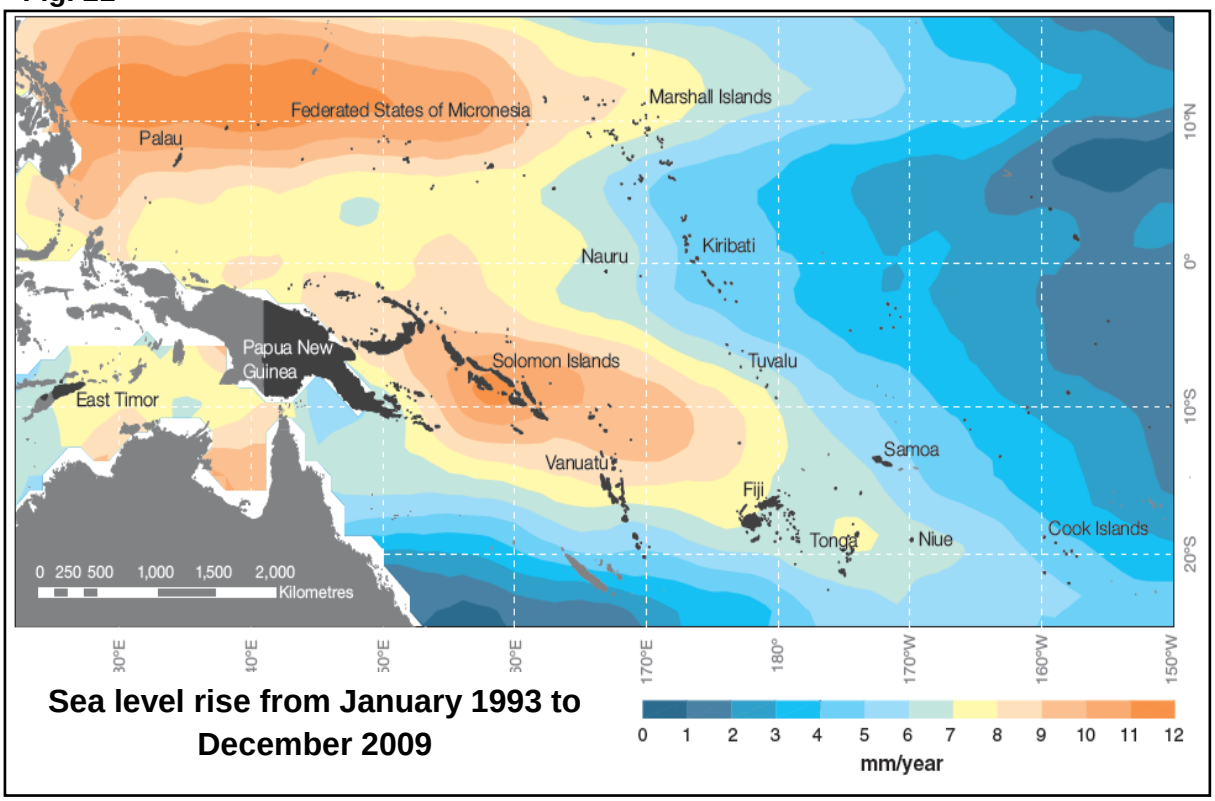
Pierce, C., 2014

Activity 7.1b – Instruction to learner:

Discussion in pairs

Use this map (Fig. 21) and your own knowledge to answer questions 1 to 4 below:

Fig. 21



1. Name two island nations where the sea level rose more than 11 mm per year between January 1993 and December 2009: _____
   _____

2. Which province in Vanuatu showed the greatest rise in sea level? _____

3. Why are there local variations in sea level rise in Vanuatu, with some areas showing a greater rise than others? _____
   _____

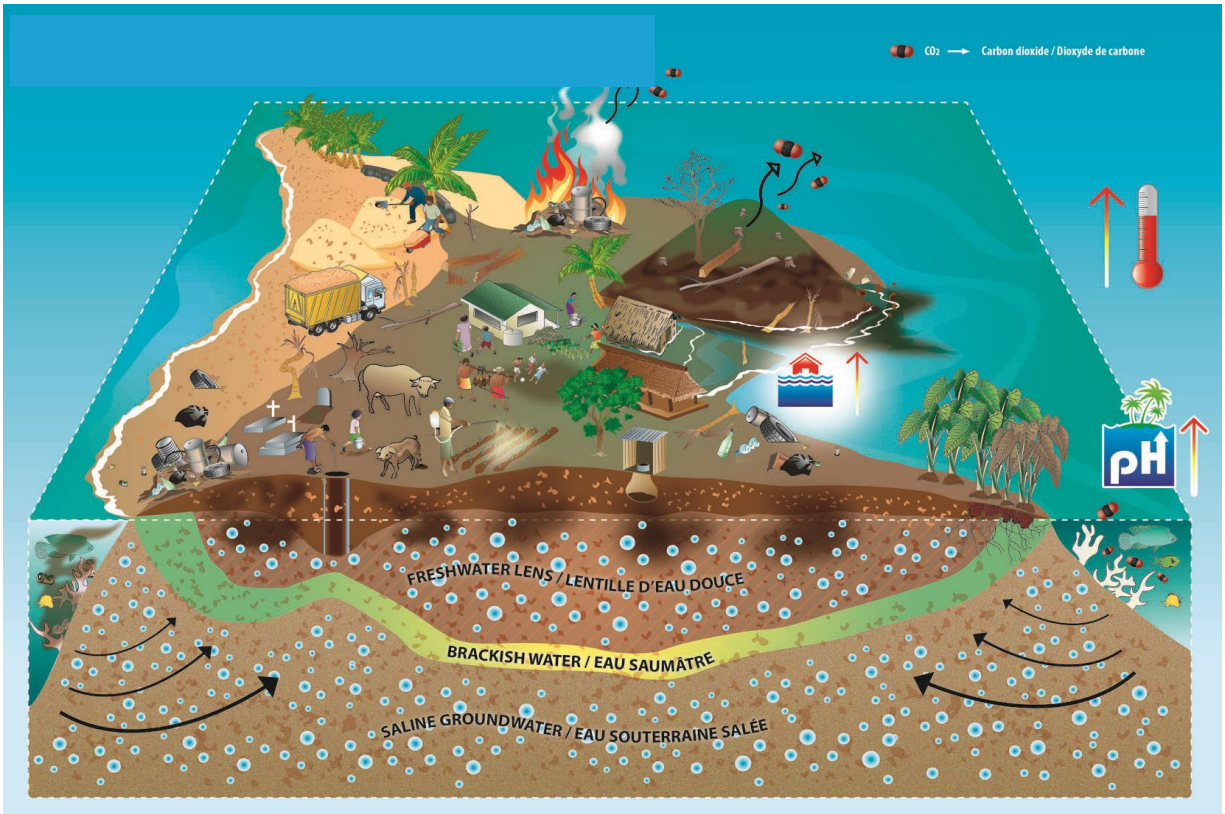
4. Why are sea levels rising? _____
   _____
   _____

Activity 7.2a – Instruction to learner:

Pair work - questions and discussion on pictures

1. Study this picture (Fig. 22), which shows how increased levels of greenhouse gases are having an effect on a small Pacific island. Then answer questions a) to c) below:

Fig. 22



SPC & GIZ 2014: *A visual guide*

a) State three ways in which people are contributing to increased levels of GHGs:

_____

_____

_____

b) How do you think the rise in sea level is affecting the underground supply of fresh water contained in the fresh water lens?_____

_____

c) What is happening to the coral reef, and why? _____

_____

_____

2. What does this picture show? It was taken near Saratamata, East Ambae.

Fig. 23

Pierce, C., 2007

_____
_____
_____
_____
_____

3. On your island, can you observe any signs of rising sea levels, coastal erosion, the degradation of coral reefs, and changing fish populations? Give some details. (If possible, do some field observations for yourselves): _____
_____
_____
_____
_____
_____
_____
_____
_____
_____

4. Thinking of your answers to questions 1, 2 and 3 above, write a few sentences to describe the kinds of problems that people in Vanuatu are going to face in the future because of rising sea levels, ocean warming and ocean acidification:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Activity 7.2b - Instruction to learner:

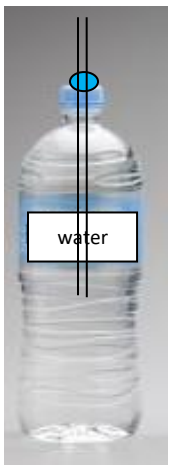
Paired activity - three experiments

You may wish to conduct the following three experiments, which are suggested in the Teacher Guide for *"Learning about climate change the Pacific way"* (SPC & GIZ, 2014). They will help you to better understand the impacts of climate change on the oceans.

Experiment I: Investigating what happens to water when it is heated

- Obtain a clear plastic drink bottle, the lid to the bottle, a straw, a piece of blu-tak, and (if possible) some natural dye or colouring to colour the water.
- Fill up the bottle almost to the top with water, and add the dye.
- Make a hole in the lid, and put in the straw at the top of the bottle. Hold it in place with the blu tak (Fig. 24).
- Press down firmly on the blu tak.
- Water should rise up in the straw. When it has stopped rising, mark the water level with a pen.
- Now put the bottle outside in the sun.
- After 10 minutes, look at the bottle, and mark where the water level is in the straw. How many mm or cm has it moved?
- Discuss why the water level has changed.

Fig. 24

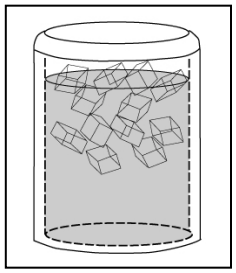


Pierce, C., / SPC & GIZ, 2014

Experiment II: Investigating what happens when floating ice melts

- Find a large plastic bottle and cut off the top. You can also use a large glass or a bucket. Fill the container or glass with water.
- Now find some ice. There may be a store in your village that has a refrigerator, and you could ask the storekeeper to give you some ice or ice cubes.
- Put the ice or ice cubes into your container of water (Fig. 25). Look at the height of the water once the ice is inside. Dry the sides of the container if the water has spilled over.
- Now let the ice melt.
- When it has melted, check the height of the water in the container. Has it changed?
- What does this tell you about the ice sheets in polar regions that are floating on the ocean. When they melt, will this change world sea levels?
- What do you think will happen when the ice sheet is covering an area of land, and this ice then melts? Will this change world sea levels?
- You could do another experiment to find this out. Find a much larger container and put a large rock inside it to represent the land. Now pour water into the container, but leave part of the rock uncovered by water. Put your ice on to the part of the rock that is not covered by water. Then let the ice melt. What happens to the level of the water in the container?
- What have you learned from this experiment? Will sea levels rise when floating ice melts? Will sea levels rise when ice that covers the land melts? Write your answers in this box:

Fig. 25



SPC & GIZ 2014

Experiment III: Investigating the effects of ocean acidification

- Collect small pieces of shell or coral and wash them carefully.
- Wrap some scotch tape (sellotape) around **part** of the shell or piece of coral.
- Fill a small container with water and squeeze some lemon or lime juice into it. Make sure it tastes sour. You have now made an acidic solution.
- Place the wrapped shell into the acidic solution and leave it overnight.
- Next day, unwrap the part of the shell that was covered in scotch tape.
- Compare the part that was wrapped with the part that was unwrapped. What do you notice?
- What does this tell you about ocean acidification? Write your answer in the box.

Activity 8.1a – Instruction to learner:

Individual exercise - short answer questions

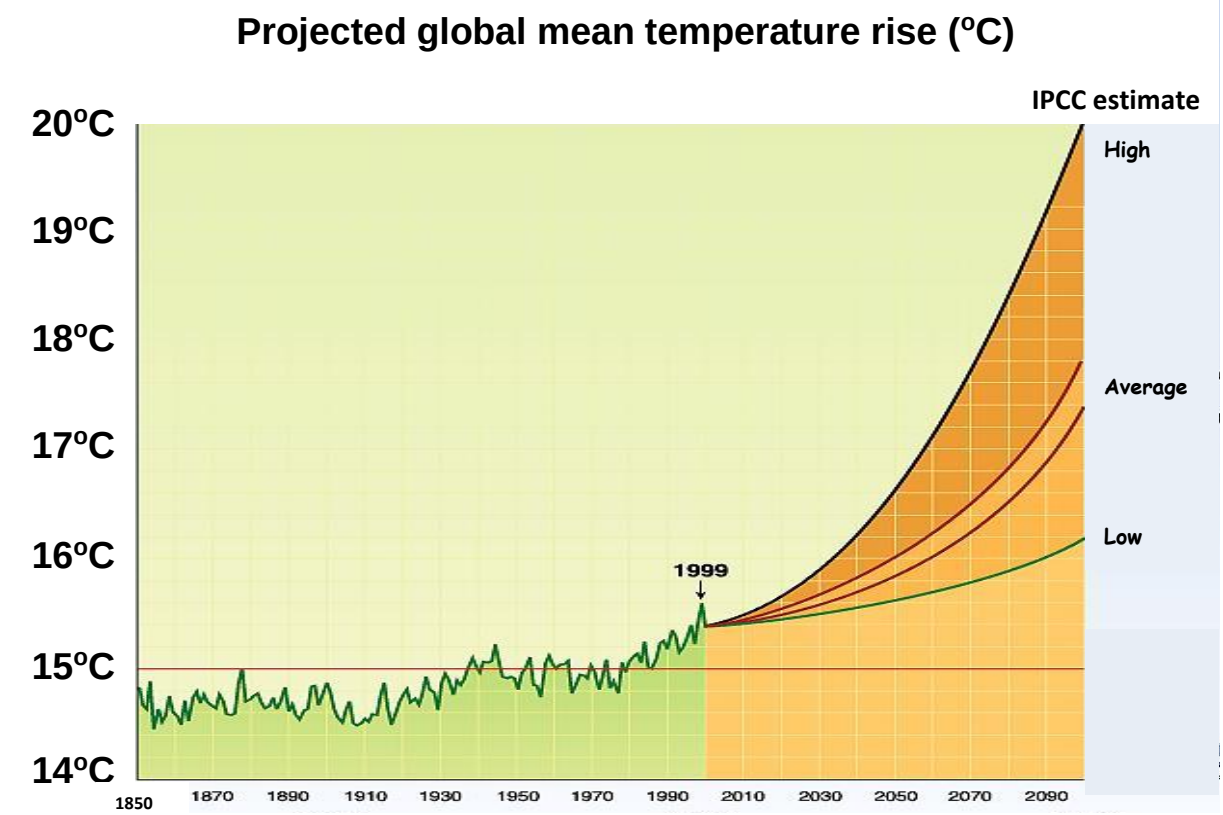
1. What is meant by a "projection of climate change", and how is it obtained? _____
   _____
   _____
   _____
2. What is meant by a "scenario"? _____
   _____
3. What three scenarios for climate change can be used? _____
   _____
   _____
4. Do you think that humans can influence future climate change? _____ Why do you say this? _____
   _____
   _____

Activity 8.1b – Instruction to learner:

Pair work - discussion of a graph

In pairs, study and discuss this graph (Fig. 26), then answer the questions below:

Fig. 26



1. What was the global average near surface temperature in 1980? _____°C

2. If humans manage to reduce greenhouse emissions from their present levels, by how much will temperature increase by 2100? _____°C

3. If human activities continue to put more and more greenhouse gases into atmosphere, by how much could the temperature increase by 2100? _____°C

4. State **three** things that are likely to happen as a result of this rise in temperature:

   _____

   _____

   _____

Activity 8.1c – Instruction to learner:

True or False?

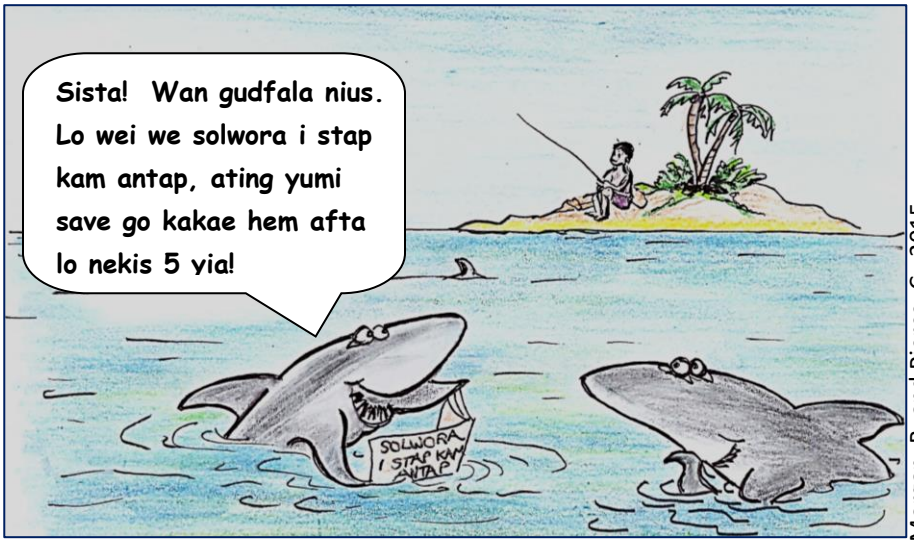
Read the climate projections for Vanuatu on page 48 of your Learner Guide, then say whether each of these statements is TRUE (T) or FALSE (F):

1. The seas around Vanuatu will become more acidic in the future. _____
2. We should expect a decrease in the number of days with extreme rainfall. _____
3. Sea-surface temperatures will rise, then fall. _____
4. Temperatures over land will rise, but there will be some variability because of the El Niño-Southern Oscillation. _____
5. There will be a decline in the number of very hot days. _____
6. Under a high emissions scenario, temperatures will be about 1°C higher in 2100 than they are at present. _____
7. We should expect more cyclones each year in the future. _____
8. We should expect cyclones to be more intense in the future. _____
9. Humidity is likely to increase in the future. _____
10. By 2030, sea levels are expected to be 5-15 cm higher than they are now. _____

Activity 8.1d – Instruction to learner:

Cartoon interpretation

Fig. 27



Morgan, B. and Pierce, C., 2015

Discuss the meaning of this cartoon (Fig. 27) with a friend:

Activity 8.1e – Instruction to learner:

Reflections

In this box, write down some of your reflections after your class discussion on how the islands and seas of Vanuatu are going to be affected by future climate change. If you prefer, you could show your ideas in the form of a picture or pictures, or a map:

ASSESSMENT OF LEARNING

You will be given a short test to find out your learning from this Unit. Here are some of the questions that you might be asked. Before the test, carefully go through these questions and think about how you might answer them.

1. Give **two** examples of periods in the Earth's history when the climate was much warmer than today, and one example of a period when it was much colder.
2. Explain, with a diagram, what happened to global sea-levels during the last Ice Age.
3. Give **two** examples of ways in which natural forcings have caused the Earth's climate to become cooler in the past.
4. Explain how the natural greenhouse effect works, using a diagram to help you.
5. Name four greenhouse gases.
6. What is the enhanced greenhouse effect?
7. Why does the burning of fossil fuels contribute to global warming?
8. How does deforestation contribute to the enhanced greenhouse effect?
9. Do you think that people in Vanuatu contribute towards global warming? How?
10. Explain **two** differences between the natural greenhouse effect and the enhanced greenhouse effect.
11. What are the impacts of increasing atmospheric CO_2 on the atmosphere?
12. What are the impacts of increasing atmospheric CO_2 on the oceans?
13. Why are sea levels rising?
14. State **three** climatic projections for Vanuatu for the present century.
15. Describe **three** changes to Vanuatu's environment that we should expect in future.

Illustrations

Fig. number	Source
Cover	Andreas / Wikimedia Commons, 2014, *Coal-burning factory in China,* accessed on 15 January 2015 at http://www.esg-search.com/wp-content/uploads/ 2014/11/ Chinese_factory_ pollution_WikimediaCommons_Andreas.jpg
1.	Pierce, C., 2014, *Table of Earth's history.*
2.	Pierce, C., 2014, *Outline for diagram of water cycle.*
3.	Pierce, C., 2014, *Outline for diagram of water cycle during a glacial period.*
4.	Pierce, C., 2014, *Diagram of the natural forcings of climate change.*
5.	Pierce, C., 2014, *Outline for table of the natural forcings of climate change.*
6.	Diagram: Pierce, C., 2014, *Solar radiation and infrared emissions*; Energy data: National Aeronautics and Space Administration (NASA), USA, accessed on 8 December 2014 at http://science-edu.larc.nasa.gov/energy_budget/pdf/ERB_Litho_v2014.06.26.pdf
7.	Pierce, C., 2014, *Step by step explanation of the natural greenhouse effect.*
8.	Pierce, C., 2014, *Outline for diagram of the natural greenhouse effect.*
9.	Pierce, C., 2014, *Outline for diagram of the enhanced greenhouse effect.*
10.	Secretariat of the Pacific Community (SPC) and Deutsche Gesellschaft für Internationale Zusammenarbait GmbH (GIZ), 2014, *Learning about Climate Change the Pacific Way: A Visual Guide – Vanuatu.* Accessed on 12 December 2014 at http://www.spc.int/images/climate-change/cc-project/Vanuatu-complete.pdf
11.	Earth Systems Research Laboratory, National Oceanic and Atmospheric Administration, 2014, *Atmospheric CO_2 at Mauna Loa Observatory*, accessed on 6 December 2014 at www.esrl.noaa.gov
12.	Pierce, C., 2013, *Village on Mota island, Vanuatu.*
13.	Pierce, C., 2014, *Table of sources of energy.*
14.	Pierce, C., 2014, *Questionnaire on human activities and global warming.*
15.	Intergovernmental Panel on Climate Change(IPCC) (5th Assessment Report): *Climate Change 2013: The Physical Science Basis: Working Group 1 Contribution to the IPCC Fifth Assessment Report,* power point presentation accessed on 5 December 2014 at http//: www.climatechange2013.org
16.	Wheeling Jesuit University / Centre for Educational Technologies / Hadley Centre of the UK Meteorological Office / Climatic Research Unit of the University of East Anglia, 1999-2014, *Resource Centre Slide Show 3/43*, accessed on 8 December 2014 at http://ete.cet.edu/gcc/?/resourcecenter/slideshow/3/43#sthash.hhlQlREf.dpuf
17.	Intergovernmental Panel on Climate Change (IPCC), 2013: *Climate Change 2013: The Physical Science Basis: Working Group 1 Contribution to the IPCC Fifth Assessment Report,* power point presentation accessed on 5 December 2014 at http//: www.climatechange2013.org

18.	World Meteorological Organization, 2014, *Number of reported disasters by decade by hazard type (1971-2010), Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes,* page 9, accessed on 13 February 2015 at 2014.06.12-WMO1123_Atlas_120614.pdf
19.	Pierce, C., 2014, *Blank flow chart.*
20.	Pierce, C., 2014, *Cartoon to show why sea levels are rising.*
21.	Australian Bureau of Meteorology (ABM) and Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2011, *Climate Change in the Pacific: Scientific Assessment and New Research, Volume 2: Country Reports - Vanuatu*
22.	Secretariat of the Pacific Community (SPC) and Deutsche Gesellschaft für Internationale Zusammenarbait GmbH (GIZ), 2014, *Learning about Climate Change the Pacific Way: A Visual Guide – Vanuatu.* Accessed on 12 December 2014 at http://www.spc.int/images/climate-change/cc-project/Vanuatu-complete.pdf
23.	Pierce, C., 2007, *Coastal erosion near Saratamata, Ambae.*
24.	Pierce, C., 2014/ Secretariat of the Pacific Community (SPC) and Deutsche Gesellschaft für Internationale Zusammenarbait GmbH (GIZ), 2014, *Learning about Climate Change the Pacific Way: Teacher's Guide – Vanuatu.*
25.	Secretariat of the Pacific Community (SPC) and Deutsche Gesellschaft für Internationale Zusammenarbait GmbH (GIZ), 2014, *Learning about Climate Change the Pacific Way: Teacher's Guide – Vanuatu*
26.	GRID Arendal /UNEP, 2005, *Projected changes in global temperature,* accessed on 6 December 2014 at http://www.grida.no/publications/vg/climate/page/3076.aspx ; Pierce, C., 2014 (labels)
27.	Morgan, B. et Pierce, C, 2015, *Sharks hoping for sea level rise.*

Assessment Feedback Form

Comments/Remarks	
Feedback to learner on assessment and / or overall recommendations and action plan for competence:	
Feedback from learner to assessor:	
Assessment judgment You have been found: ◯ Competent ◯ Not yet competent in this unit standard	Action to follow: ◯ Assessor report to VIT ◯ Learner results and attendance certification issued
Learner's signature:	**Date:**
Assessor's signature:	**Date:**
Moderator' signature:	**Date:**

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