

Learner Workbook

Certificate I in Climate Change and Disaster Risk Reduction

CCDRR02

Explain the principal features of
Vanuatu's climate and its short-
term and long-term variations



Facilitator:

Organisation:

Year/Dates:

Before we start...

This Learner Workbook is designed to accompany the Learner Guide for the unit of competency CCDRR02. It provides learner-centred activities and assessment tools to foster learning of key concepts and skills in this unit, which forms part of Certificate I in Climate Change and Disaster Risk Reduction. The competencies developed are line with the key competencies promoted by VRDTCA to foster greater empowerment and success in the work place. Additionally, a Facilitator Guide for this unit 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 this specific unit standard as per the requirements of VRDTCA. 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: Explain the principal features of Vanuatu's climate and its short-term and long-term variations

VRDTCA No. CCDRR02

NTQF Level: 1

Credits: 6

This unit standard is one of the building blocks in the qualification listed below:

Title	ID Number	NTQF Level	Credits
Certificate 1 in Climate Change and Disaster Risk Reduction	1	46

Please mark the learning programme in which you are enrolled:

Are you enrolled in a:	Yes	No
Leadership?	<input type="checkbox"/>	<input type="checkbox"/>
Skills Program?	<input type="checkbox"/>	<input type="checkbox"/>
Short Course?	<input type="checkbox"/>	<input type="checkbox"/>

Note to Assessor:

If you are assessing this module as part of a full qualification or learnership, please ensure that you have familiarized yourself with the content of the qualification.

Activity 1.1 – Instruction to learner:

Class discussion

After discussing the elements of weather and climate with your fellow trainees and your tutor, complete the following table to show the main elements of weather:

MAIN ELEMENTS OF WEATHER			
1.		7.	
2.		8.	
3.		9.	
4.		10.	
5.		11.	
6.		12.	

Activity 1.2a – Instruction to learner:

Weather observations and calculations

1. Keep a **weather log** for one week. Choose a time during the day to go outside and observe the weather, then write down your observations about the temperature, the humidity, the rainfall, the wind and the cloudiness. Then do the same thing at the same time for the next 6 days. Here is an example of a weather log for 4 days in June:

Day and date	Time	Observations
Monday 2 nd June 2014	12 noon	Hot. Sunny. No cloud in the sky. Strong wind coming from the south-east. Air feels quite dry.
Tuesday 3 rd June 2014	12 noon	Quite hot. Cloudy. Wind coming from the south-east. Feel a bit sticky.
Wednesday 4 th June 2014	12 noon	Cool. Steady rain falling. Sky completely covered in cloud.
Thursday 5 th June 2014	12 noon	Cool. Rain showers. Cloudy. Air feels fresh

You can write your observations in the table on the next page:

Name of observer: Place of observation:

Island:		
Day and date	Time	Observations

2. On 31st May 2014, Sola recorded these maximum and minimum temperatures:



30 °C



24°C

What was the mean daily temperature for Sola on 31st May 2014?

3. Calculate the mean monthly temperature for Sola for May 2014. Here are the mean daily temperatures in °C for the 31 days in May: 28, 29, 28, 27, 26, 27, 27, 28, 28, 27, 29, 26, 27, 26, 28, 26, 27, 25, 27, 28, 27, 26, 28, 27, 27, 27, 26, 27, 27, 26, 27.

(Add up all these figures, then divide the total by the number of days in May, i.e. 31).

Answer:

Activity 1.2b – Instruction to learner:

Class discussion and individual exercise

1. After discussing the climate of Port Vila with your fellow-trainees and your tutor, answer the following questions:
 - a) Which is Port Vila's hottest month? Describe its temperature:
 - b) Which are Port Vila's two coolest months? and
Describe their temperature:
 - c) How would you describe Port Vila's total rainfall in one year?
 - d) Which are the five wettest months in the year?
.....
.....
.....
 - e) Is there more rain in the hot season or in the cool season?
2. Look at these climatic figures for 2013. Find the place that is closest to you, and describe its climate in the same way that you described the climate of Port Vila in question 1. If you live on Efate, choose another place rather than Port Vila.

SOLA, VANUA LAVA, 2013

	J	F	M	A	M	J	J	A	S	O	N	D	Total
Temp (°C)	30	29	29	29	28	28	27	27	27	27	29	31	
Rainfall (mm)	524	569	658	253	414	314	491	70	196	763	340 _e	237	4,829

PEKOA, SANTO, 2013

	J	F	M	A	M	J	J	A	S	O	N	D	Total
Temp (°C)	27	27	27	27	26	26	25	25	25	26	27	27	
Rainfall (mm)	277	320 _e	879	134	284	215	347	8	126	144	212	123	3,069

LAMAP, MALAKULA, 2013

	J	F	M	A	M	J	J	A	S	O	N	D	Total
Temp (°C)	28	29	28	29	27	26	26	26	26	27	28	29	
Rainfall (mm)	106	221	538	161	193	222	113	10	119	109	352	107	2,251

WHITEGRASS, TANNA, 2013

	J	F	M	A	M	J	J	A	S	O	N	D	Total
Temp (°C)	26	26	26	25	24	23	22	22	22	23	25	26	
Rainfall (mm)	28	196	184	210 _e	240	103	17	28	64	52 _e	36	69	1,227

ANELGOWGHAT, ANEITYUM, 2013

	J	F	M	A	M	J	J	A	S	O	N	D	Total
Temp (°C)	26	26	26	25	23	23	22	22	22	23	25	26	
Rainfall (mm)	123	236	256	336	409	136	116	132	97	154	56	418	2,469

All statistics provided by VMGD.

Note: e = estimated.

- Which is the hottest month? Describe its temperature:
- Which is the coolest month? Describe its temperature:
- How would you describe the total rainfall in one year?
- Which are wettest months in the year?
- Is there more rain in the hot season or in the cool season?
- What is the average yearly (annual) temperature for your chosen place?°C

- Do you think the weather at your Rural Training Centre is the same as the climate?
Give some reasons for your answer:

Activity 1.3 – Instruction to learner:

Pair work - questions on the diagrams of world climatic zones

In pairs, refer to the diagrams on world climatic zones in your Learner Guide (Fig. 7 and Fig. 8), then answer these questions:

1. Using Fig. 7 of the Learner Guide and your own ideas, complete the gaps in this table:

Name of climatic zone	Between which latitudes?	Description of temperature
NORTH POLAR	North Pole and Arctic Circle	COLD
NORTH TEMPERATE	Arctic Circle and 35°N	COOL
	35°N and Tropic of Cancer	WARM
NORTH TROPICAL		HOT
	Equator and Tropic of Capricorn	
SOUTH SUB-TROPICAL		
		COOL
	Antarctic Circle and South Pole	

2. Using Fig 8 of the Learner Guide, state whether these sentences are TRUE or FALSE:

- a) Penguins are found in the temperate zone:
- b) Papua New Guinea and Vanuatu are in the tropical zone:
- c) In the polar zones, it is too cold for trees to grow:
- d) The southern sub-tropical zone is found north of the Tropic of Capricorn:
- e) Australia extends from the tropical zone to the temperate zone:

Activity 1.4 - Instruction to learner:

Paragraph writing

Explain in your words the difference between “weather” and “climate”. Give some examples to illustrate your answer:

Activity 2.1 - Instruction to learner:

Definitions

Write your own definitions of “climate variability” and “climate change”:

Climate variability: _____

Climate change: _____

Now try and summarize the difference between the two: _____

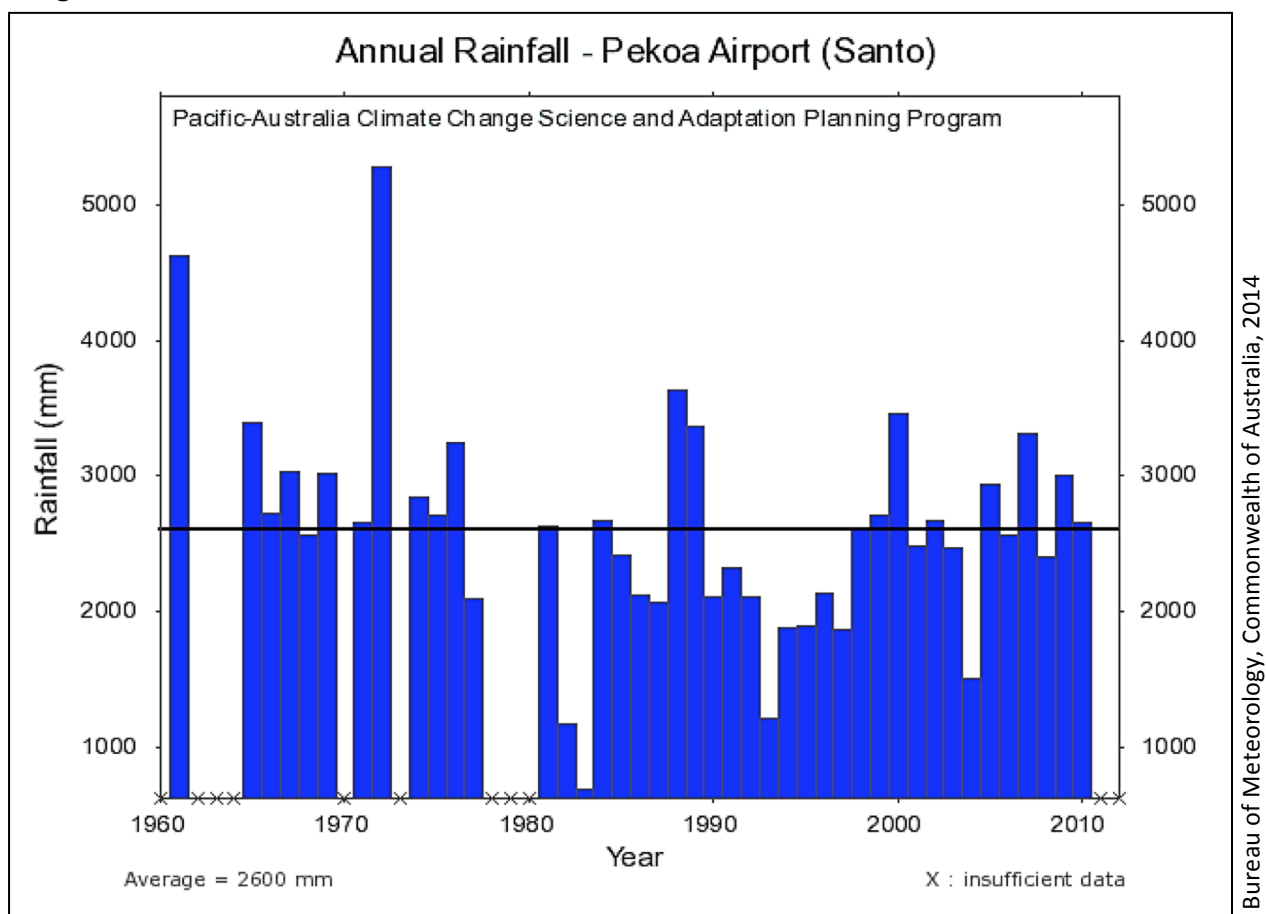
Activity 2.2 – Instruction to learner:

Pair work - interpretation of graphs

1. In 2.2 of your Learner Guide, study the variability of December temperatures and rainfall at Bauerfield between the years 2010, 2011 and 2012. Then discuss this variability with a friend, and write down what you notice:

2. Discuss this graph (Fig. 1) with a friend, then answer the questions below:

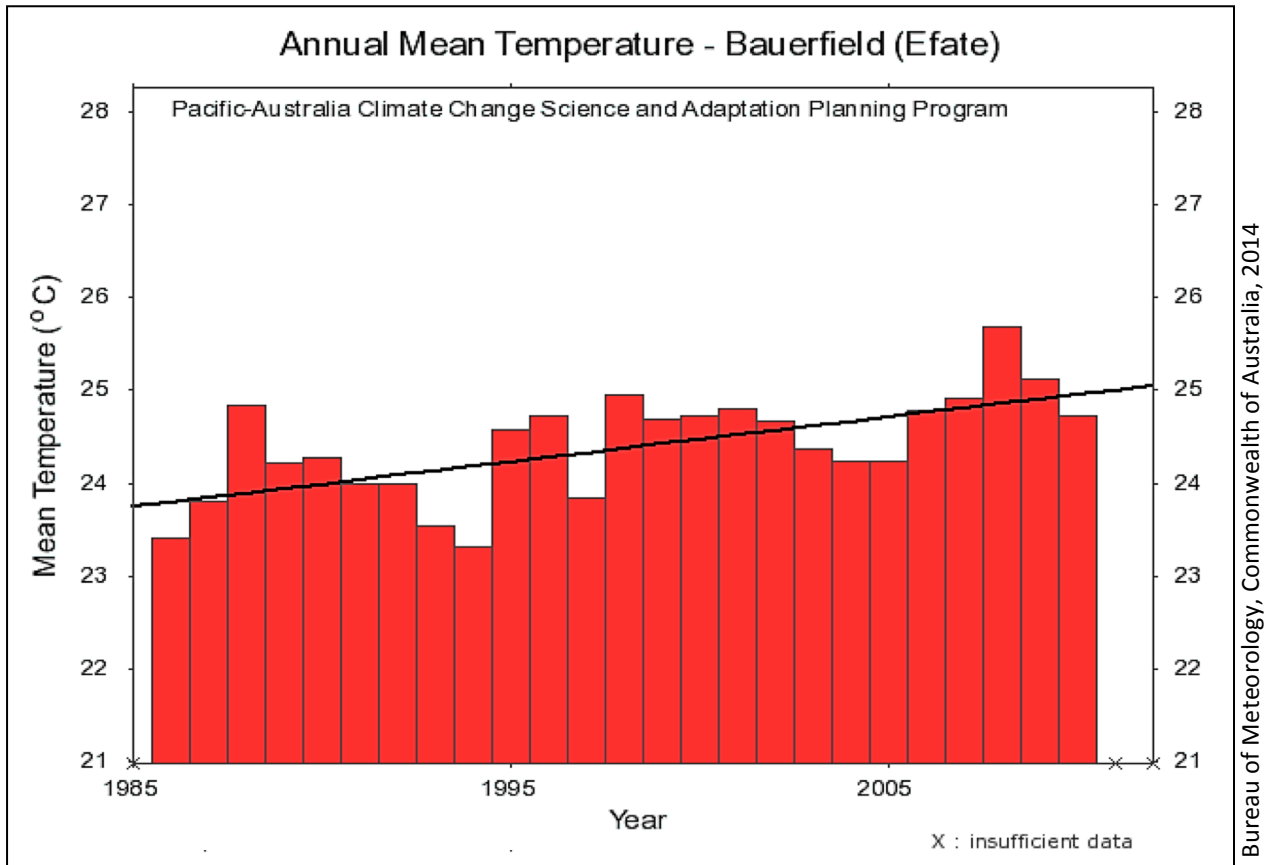
Fig. 1



- What does the thick black horizontal line show? _____
- What does the symbol “x” mean? _____
- Which was the wettest year? _____
- In how many years was the rainfall above the average? _____
- What does this graph tell you about the variability of the rainfall from year to year at Pekoa? _____

3. Discuss this graph (Fig. 2) with a friend, then answer the questions below:

Fig. 2



- What is meant by the “annual mean temperature”? How do you think it is calculated? _____

- Which was the hottest year? _____ What was the temperature? _____
- The black line is called a trend line. What does it show? _____

- Why can we say that this graph demonstrates climate change? _____

Activity 3.1 – Instruction to learner:

Short talk

Refer to the table of average monthly temperatures and total monthly rainfall for Port Vila and the associated climograph in your Learner Guide. Divide into pairs. Each member of the pair takes it in turns to describe how Port Vila's temperature and rainfall change during the year. Use your answers to the following questions as a guide:

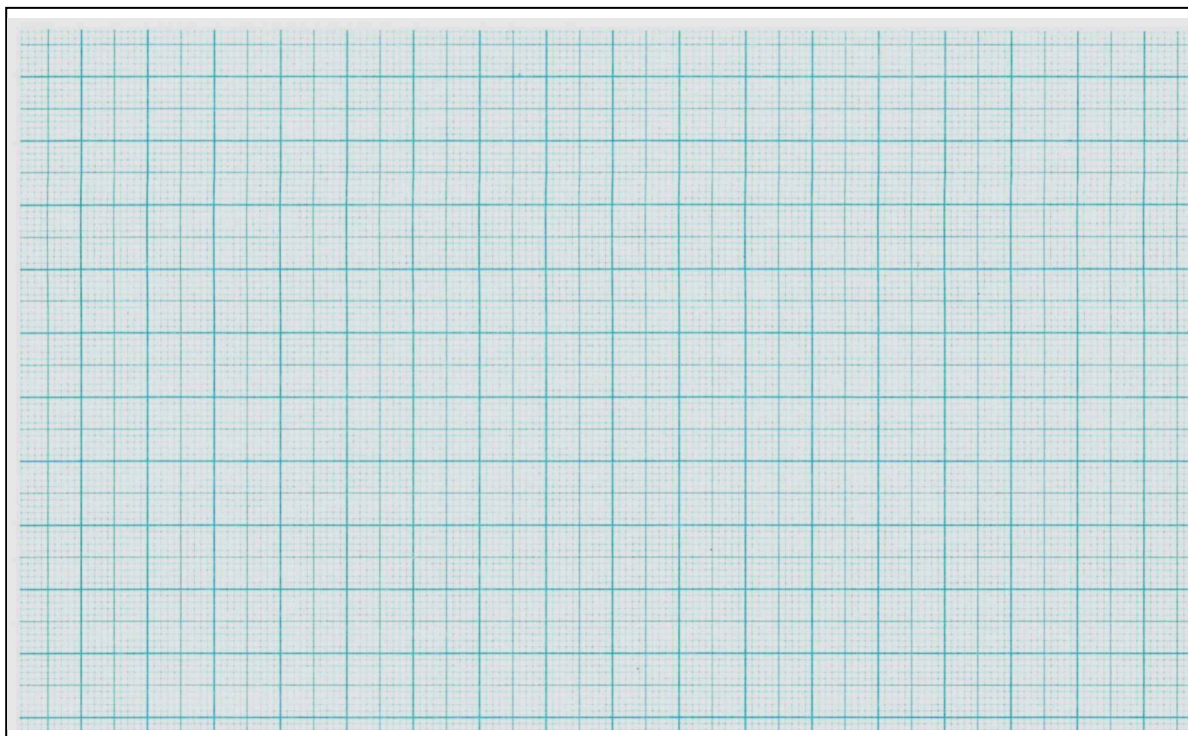
Which are the hottest and the coldest months? What is the range of temperature? Do you think that the average monthly temperature changes very much during the year? Which are the wettest months? Which are the driest? Can we say that Port Vila has a hot, wet season and a cooler, drier season? Which are the months in each of these seasons?

Activity 3.2 – Instruction to learner:

Drawing a climograph

Choose one meteorological station from the following: SOLA, PEKOA, LAMAP, WHITEGRASS, ANELGOWHAT. Draw a climograph for your chosen station on the graph paper below (Fig. 3). Follow the instructions in your Learner Guide (page 24):

Fig. 3



A

Activity 4.1 – Instruction to learner:

Matching exercise

Match each of the items in List A with the correct word(s) in List B:

LIST A

1. Amount of water vapour in the air
2. Change of water from a gaseous to a liquid state
3. Rainfall that occurs when warm moist air rises up a mountain
4. Causes evaporation
5. Change of water from a liquid to a gaseous state
6. Water in a gaseous state
7. Visible drops of water or ice that fall to the ground from clouds

LIST B

- PRECIPITATION
- HEAT
- HUMIDITY
- WATER VAPOUR
- OROGRAPHIC
- CONDENSATION
- EVAPORATION

Activity 4.2 – Instruction to learner:

Sentence completion

Complete the missing words in these sentences:

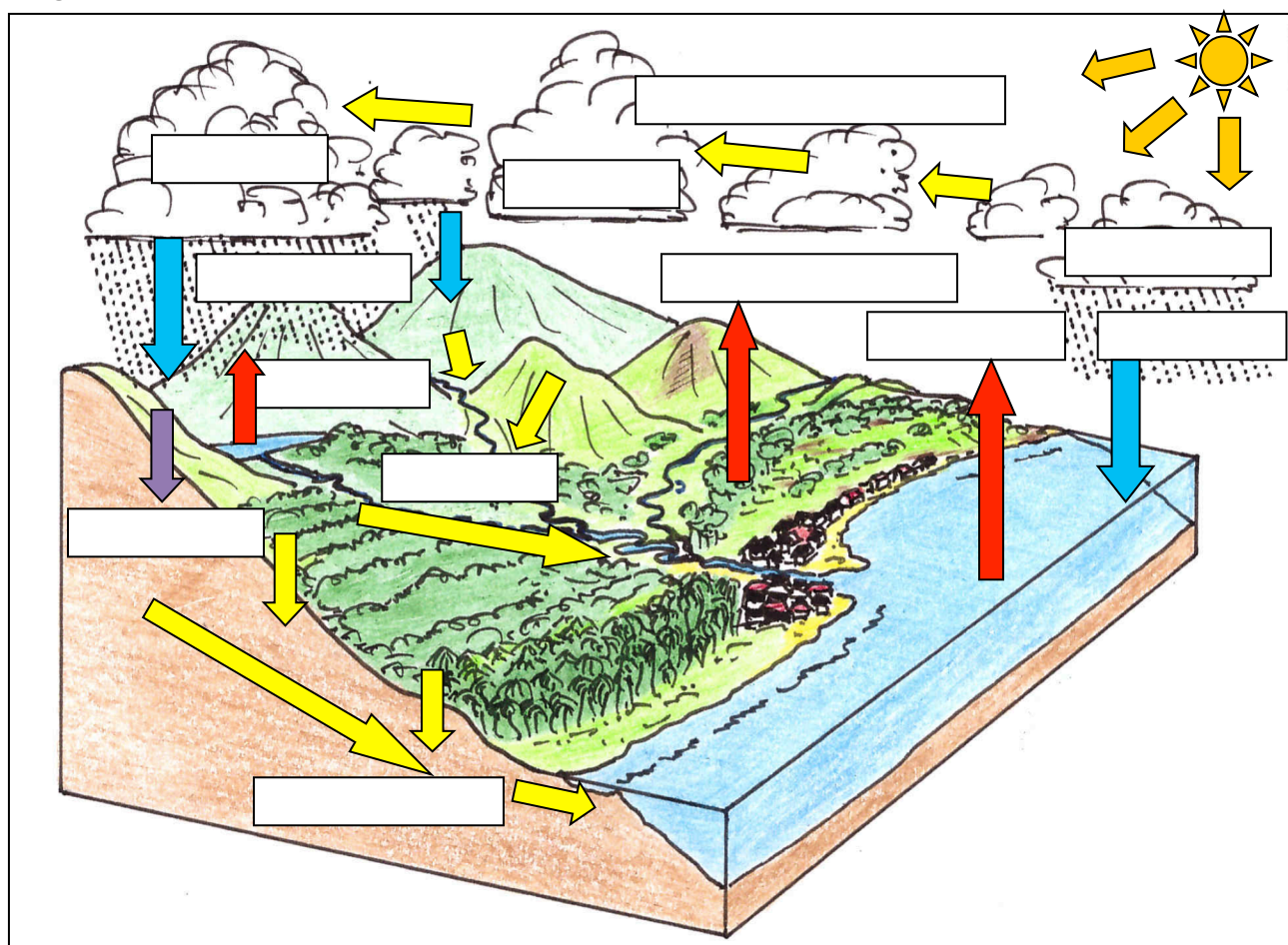
1. The warmer the air, the water vapour it can hold.
2. At a temperature of 20°C, the air can hold grams of water vapour per m³.
3. When the heats the ocean, some of the water will
4. When occurs, tiny droplets of water form in the atmosphere.
5. Condensation leads to when water droplets become too heavy.
6. The drier area in the leeward side of a mountain is called the

Activity 4.3 – Instruction to learner:

Completing and explaining a diagram

- Complete the labelling of this diagram (Fig. 4) to show the different processes taking place in the water cycle. Choose your labels from the list below the diagram.

Fig. 4



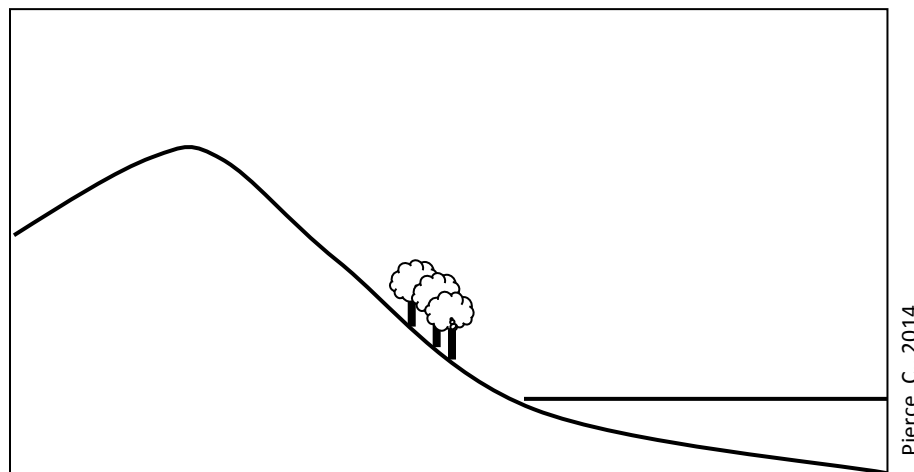
Pierce, C., 2014

Evaporation	Evapo-transpiration
Transport of vapour	Infiltration
Condensation	Precipitation
Underground flow	Run-off

Note: some of these labels are repeated in the diagram!

- Copy this outline (Fig. 5) on to a large piece of butcher paper. Then complete it to show a simple diagram of the water cycle to show all the main processes.

Fig. 5



- Form pairs. One person in each pair should explain the water cycle to the other person, using the diagram completed in number 2 above.

Activity 5.1a – Instruction to learner:

Individual exercise: short answer questions

Say whether each of these statements is **TRUE** or **FALSE**:

- As you move southwards from the Equator, the temperature gets colder:
- Temperature increases with latitude:
- In December, the zone of greatest heating extends from the Equator southwards to the Tropic of Capricorn:
- In June, the zone of greatest heating extends from the Equator northwards to the Tropic of Cancer:
- On Malakula, the average monthly temperature in June is 26°C:
- On average, the Lamap airport is wetter than Pekoa airport:
- Temperature decreases with altitude:
- Most people living in Vanuatu do not usually experience extremes of temperature because they live close to the sea:
- Whitegrass airport on Tanna lies in a rain-shadow area:
- South-east Santo is liable to flooding because it is on the windward side of the island and there are many large rivers there.

Activity 5.1b – Instruction to learner:

Discussion in pairs

Work with a friend to find answers to the following questions:

1. Why is it hot all year round close to the Equator? _____

2. Why are islands in the north of Vanuatu wetter than those further south?

3. Why does it get cooler as you go upwards into the atmosphere?

4. Why is the south-east side of Malakula wetter than the north-west side?

Activity 5.2a - Instruction to learner:

Answers to class discussion

Discuss the questions on page 36 of the Learner Guide, then write your answers here:

1. Which parts of Vanuatu are the most liable to drought? Give names of islands and parts of islands.

2. In which months of the year is drought most likely to occur?

3. Which parts of Vanuatu are the most liable to flooding? Give names of islands and parts of islands.

4. In which months of the year is flooding most likely to occur?

Activity 5.2b - Instruction to learner:

Group work - drawing a sketch map

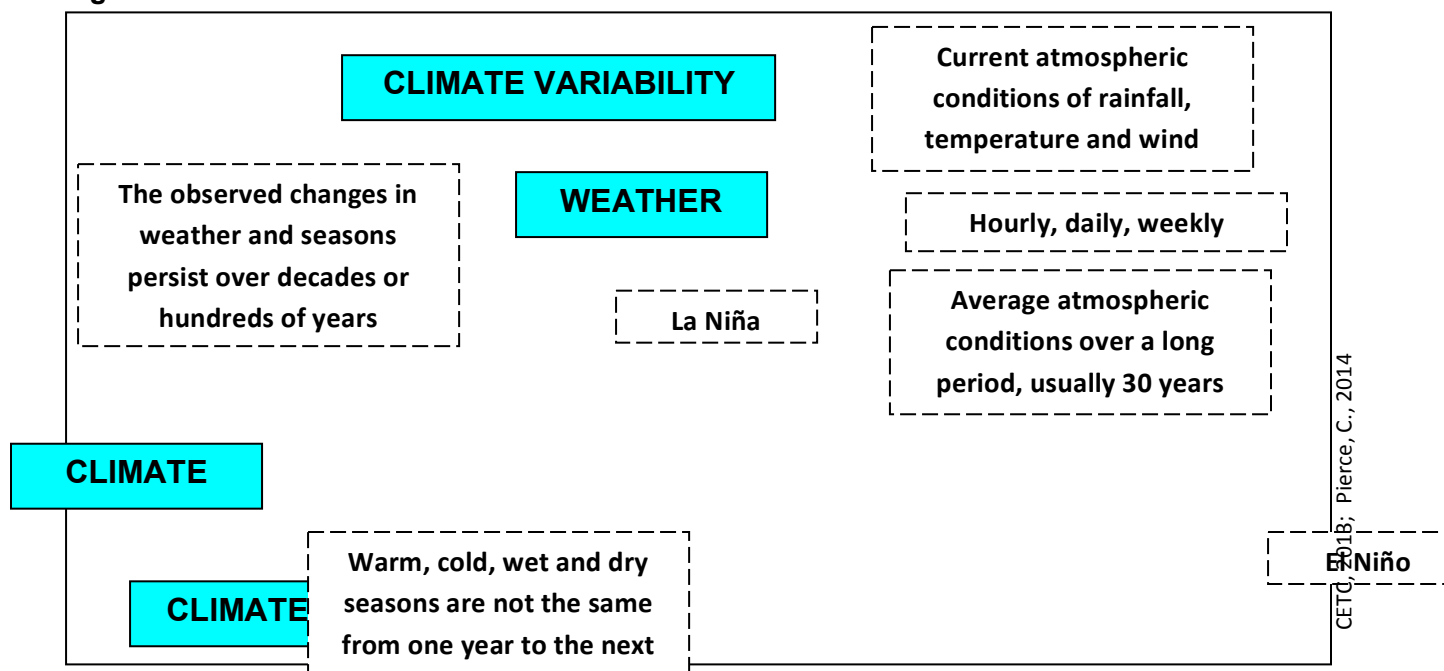
Form small groups of three or four trainees. Draw a large sketch map of your island on a piece of butcher paper. The map should show high ground, the direction of prevailing winds and important rivers (if there are any). On your map, show those places that are in the greatest risk of river flooding during a cyclone, and those that are the most likely to suffer from a long period of drought.

Activity 6.1 - Instruction to learner:

Definitions

- In Fig. 6 below, draw arrows to join the words in the white boxes with the correct term in the four blue boxes:

Fig. 6



- Write your own definitions of “convergence zone” and “climate drivers”:

Convergence zone: _____

Climate drivers: _____

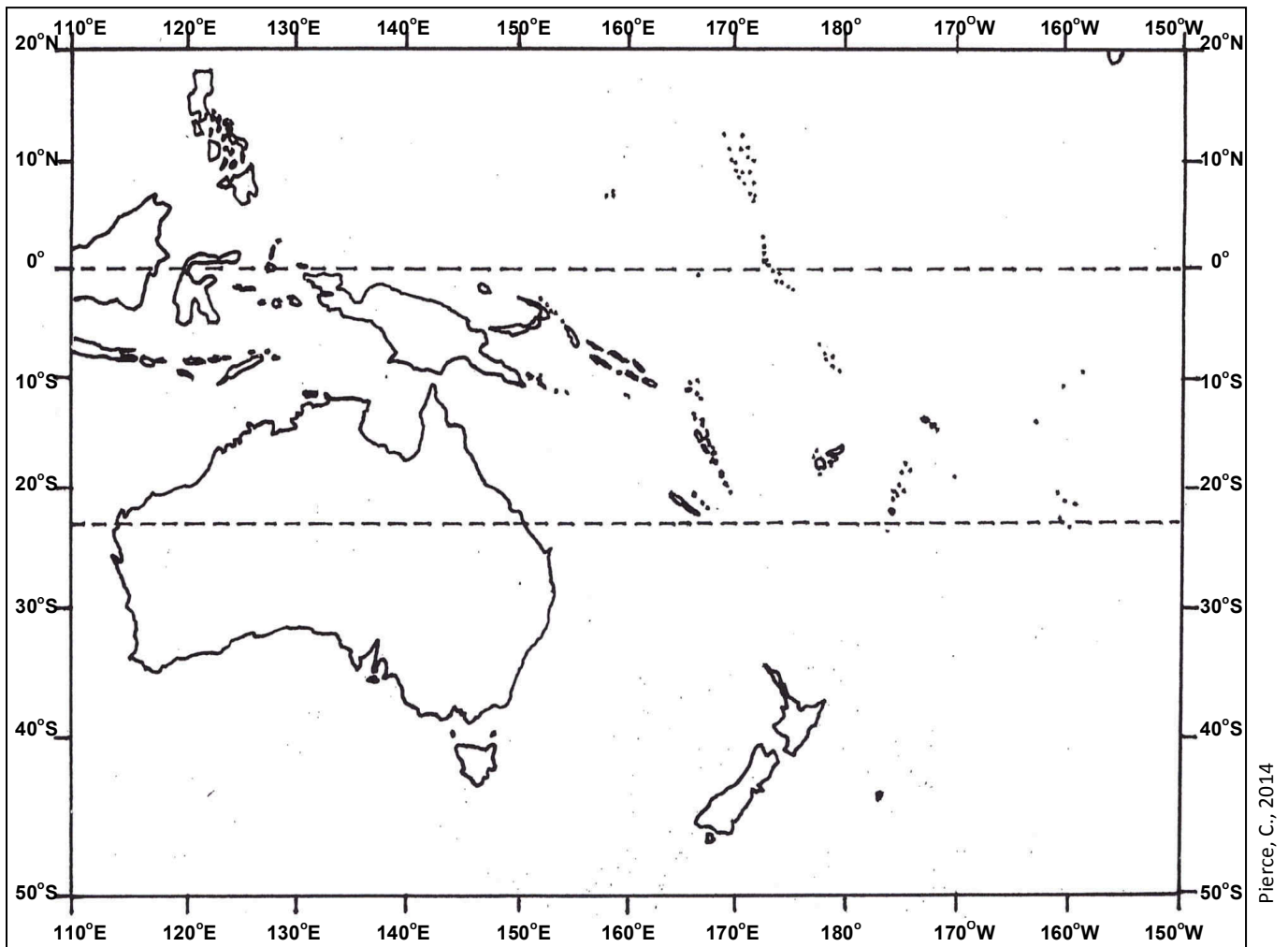
Activity 6.2 - Instruction to learner:

Identify features on a map of the Pacific

Using the map (Fig. 31) on page 38 of your Learner Guide, show the following on Fig. 7 below:

- Names of countries
- The Equator and the Tropic of Capricorn
- The Inter-Tropical Convergence Zone
- The South Pacific Convergence Zone
- The Trade winds
- The “warm pool” of water in the western Pacific

Fig. 7



Activity 6.3a - Instruction to learner:

Short answers

1. What happens to the “warm pool” of water in the western Pacific during an El Niño period? _____
2. What effect does the movement of the warm pool have on the South Pacific Convergence Zone? _____

3. What kind of weather does an El Niño period bring to the islands of the western Pacific and the east of Australia? _____

4. What happens to the “warm pool” during a La Niña period: _____

5. What effect does the movement of the warm pool have on the South Pacific Convergence zone? _____

6. What kind of weather does a La Niña period bring to the islands of the western Pacific and the east of Australia? _____

7. Do El Niño periods and La Niña periods happen all the time? _____
What is the weather like in Vanuatu when we are not experiencing an El Niño or a La Niña season? _____

8. When should Vanuatu expect to have more cyclones and more floods? _____

Activity 6.3b - Instruction to learner:

Pair work - analysis of a picture

The picture below (Fig. 8) shows what might happen on the imaginary Pacific island of Pasifika during an El Niño period. In pairs, analyse the picture and write down six (6) ways in which El Niño is affecting people, property and the environment:

Fig. 8



1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

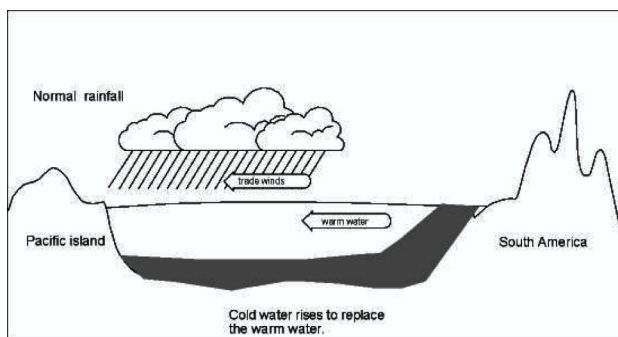
Activity 6.4 - Instruction to learner:

Pair work - giving a talk about ENSO and its effects

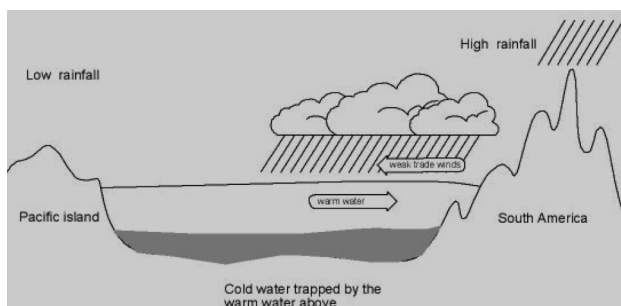
Form pairs. Each pair should then prepare a short talk on the El Niño-Southern Oscillation to give to others in the class or to a group of people in the local community. You should watch the cartoon film “*Klaod Nasara*”, and also think about how a real El Niño or La Niña event has affected your local community in the past.

You will need to draw large diagrams to illustrate your talk. You can explain how the warm pool moves from side to side across the Pacific, and how this affects rainfall patterns in Vanuatu. You can draw simple diagrams like the ones shown below:

Fig. 9:
Normal situation



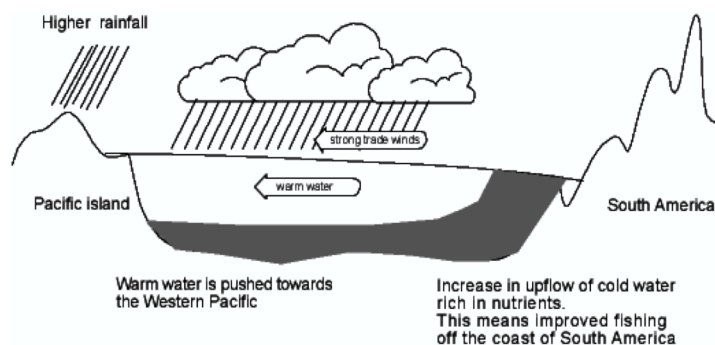
SPC & GIZ, 2013:
Draft Teacher guide



SPC & GIZ, 2013:
Draft Teacher guide

Fig. 10:
El Niño season

Fig. 11:
La Niña season



SPC & GIZ, 2013:
Draft Teacher guide

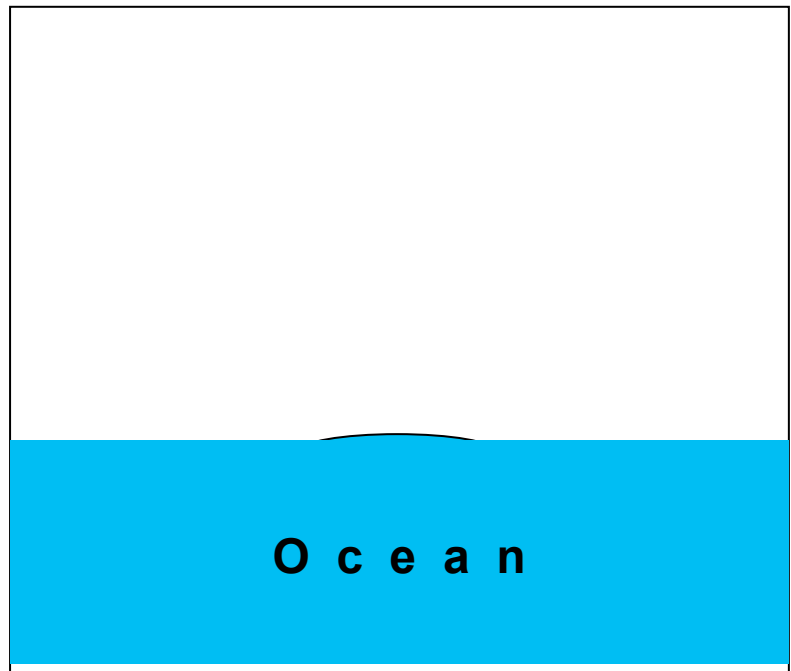
Activity 7.1 - Instruction to learner:

Drawing a diagram

In the box on the right (Fig. 12), draw a diagram to show a cross-section through a tropical cyclone. Show the following:

- Winds blowing into the centre of the cyclone and rising up
- The eye of the cyclone
- The eye walls of the cyclone
- Clouds and heavy rain
- The storm surge
- The area of lowest pressure

Fig. 12



Activity 7.2a - Instruction to learner:

Sentence completion.

Complete the missing words:

As a tropical cyclone approaches, the winds become They are most destructive in the of the cyclone. In the eye of the cyclone, there is wind and the pressure is very After the eye passes over you, the winds blow in the direction. A cyclone brings rainfall, which often causes and A very dangerous part of the cyclone is the, which can cause great destruction to villages along the coast.

Activity 7.2b - Instruction to learner:

Pair work - analysis of a picture.

This picture (Fig. 13) shows what might happen on the imaginary Pacific island of Pasifika after a severe cyclone during a La Niña period. In pairs, analyse the picture and write down eight (8) ways in which the cyclone has affected people, property and the environment:

Fig. 13



1. _____
2. _____
3. _____
4. _____
6. _____
7. _____
8. _____

Activity 7.3 - Instruction to learner:

Telling stories in a group

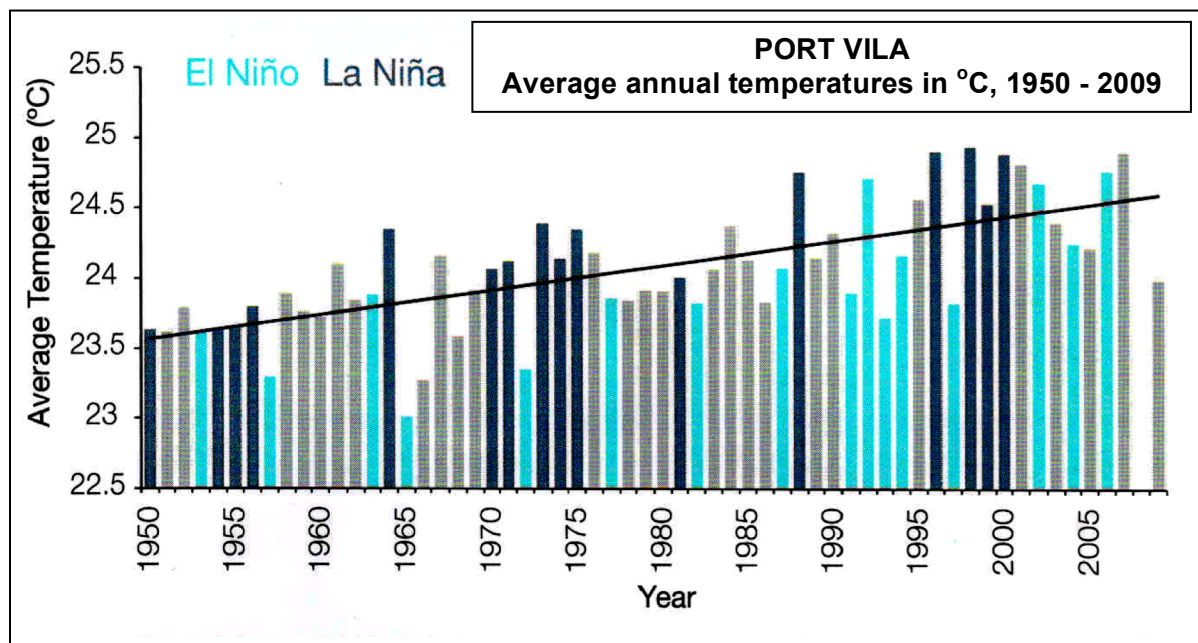
The class can divide into small groups of 5 or 6 people. In each group, learners can share stories from their own personal experiences of what it was like to be in a cyclone. As far as possible, you should say where you were when the cyclone arrived, and give the cyclone's name and approximate date of arrival. Indicate whether there were any warnings, what you and the community did to prepare and protect yourselves, what the weather conditions were like, and what kind of damage was done. This story-telling can also be done as a whole class activity, if you and the facilitator prefer.

Activity 8.1a - Instruction to learner:

Pair work - analysis of graphs, maps and diagrams

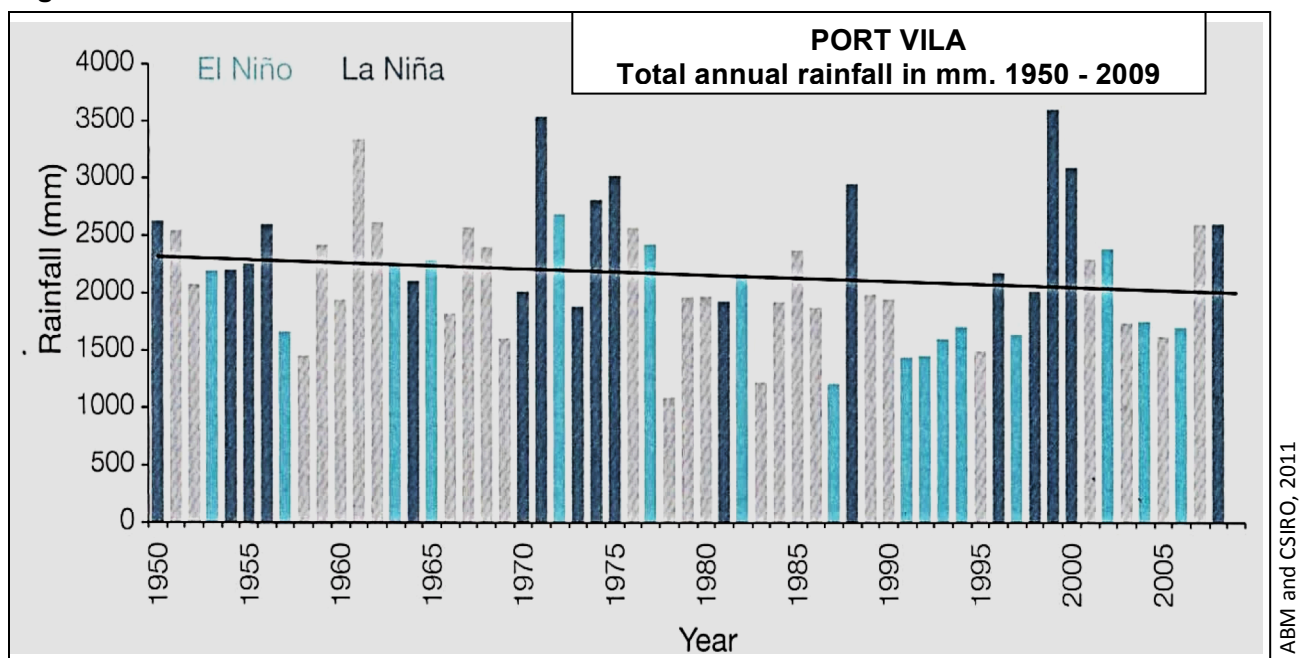
1. In pairs, study these graphs of temperature and rainfall changes in Port Vila (Figs. 14 and 15), then answer the questions that follow:

Fig. 14



ABM and CSIRO, 2011

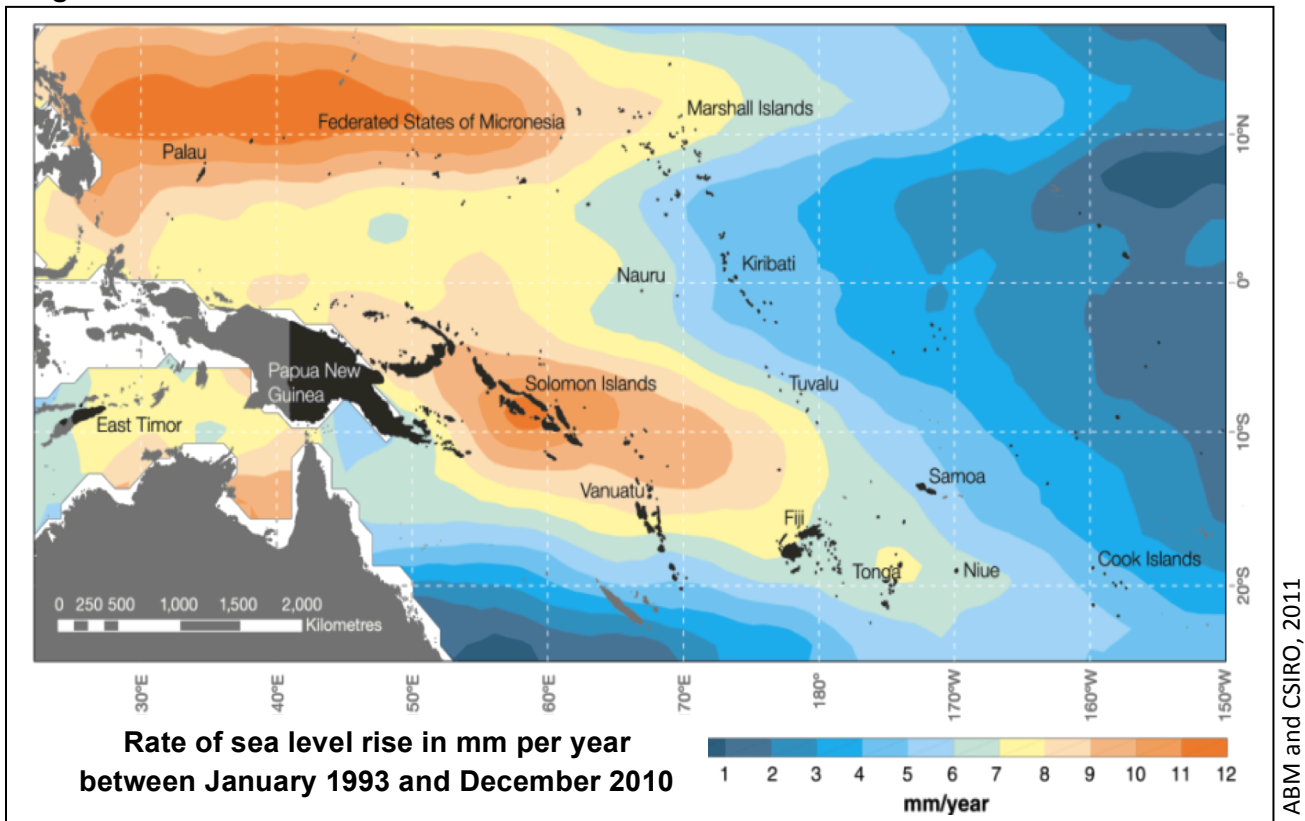
Fig. 15



- Do these two graphs show climate variability, climate change or both climate variability and climate change? _____
- In an El Niño year, are temperatures generally lower or higher than normal? _____
- In an El Niño year, are rainfall totals generally higher or lower than normal? _____
- In a La Niña year, are temperatures generally lower or higher than normal? _____
- In a La Niña year, are rainfall totals generally higher or lower than normal? _____
- Over the last 50 years in Port Vila, has the average temperature increased? _____
- Over the last 50 years in Port Vila, what trend can you see in the total annual rainfall? _____
- Do these graphs provide evidence that Port Vila's climate is changing? _____

2. Still in pairs, study this map (Fig. 16) and answer the questions that follow:

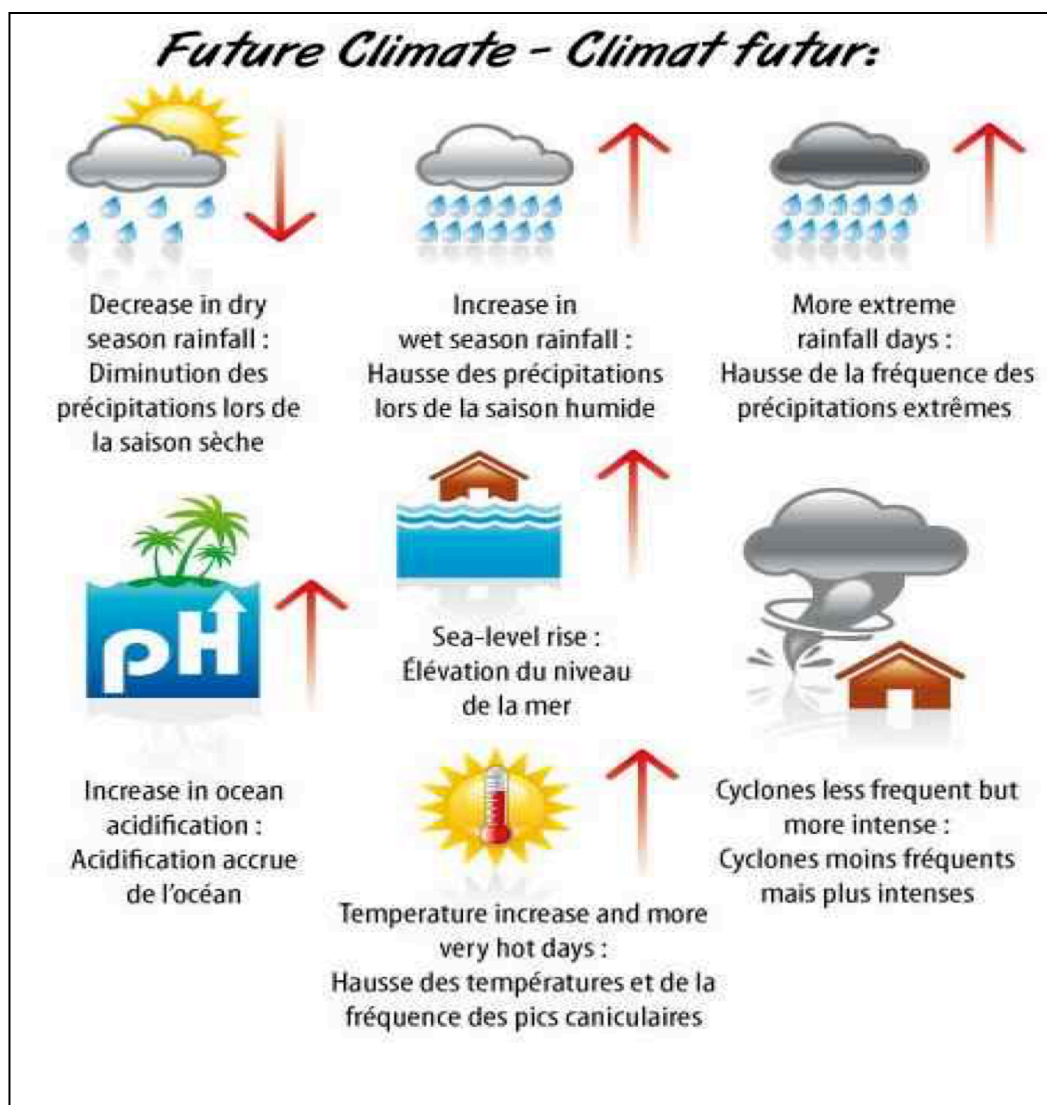
Fig. 16



- By how many mm is the sea level rising each year around the Torres and northern Banks islands of Vanuatu? _____
- By how many mm is the sea level rising each year around Aneityum? _____
- In general, which parts of Vanuatu are already suffering the greatest impacts of sea-level rise? _____
- What is causing this sea level rise? _____
- Do you think the sea level will continue to rise? _____ Why do you say this? _____

2. Here is a summary of the future changes in weather, sea level and oceanic acidity that are likely to take place in Vanuatu.

Fig. 17



SPC & GIZ, 2014: A visual guide

Which things are likely to increase in the future?

Which things are likely to decrease in the future?

Activity 8.1b - Instruction to learner:

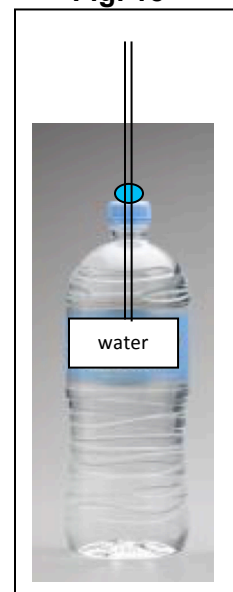
Paired activity - an experiment

You may wish to conduct the following experiment, which is suggested in the Teacher Guide for *“Learning about climate change the Pacific way”* (SPC & GIZ, 2014). It will help you to better understand the impacts of climate change on the oceans.

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. 18).
- 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. 18



Pierce, C., 2014

Use this box to write down or draw pictures of your findings from this experiment:

Activity 8.1c - Instruction to learner:

Individual reflection

Think about the changes in climate, sea level and ocean acidity that are likely to occur in Vanuatu in the future. Write down some of the ways in which people, their properties and the environment might be affected. Then reflect upon some of the steps that could be taken to reduce the negative impacts of these changes.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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. Name five elements of weather and climate.
2. What is the difference between weather and climate?
3. If the maximum daily temperature at a place is 31°C and the minimum daily temperature is 23°C, what is the mean daily temperature?
4. What is the difference between climate variability and climate change?
5. What climatic change has been taking place during the last 200 years and is expected to continue?
6. Explain why rain occurs when air rises up.
7. Draw a diagram of the water cycle and label all the processes taking place.
8. How do latitude and altitude affect climate? Give some examples from Vanuatu.
9. Briefly describe the four key climate “drivers” operating in Vanuatu.
10. What kind of weather would we expect in Vanuatu during an El Niño period?
11. What happens to the warm pool of water in the western Pacific during a La Niña period? What kind of weather would we expect in Vanuatu?
12. Why are tropical cyclones so destructive?
13. How have Vanuatu's temperature and rainfall patterns, sea levels and ocean pH changed in recent years, and how are they likely to change in the future?
14. How do emissions of greenhouse gases affect atmospheric temperatures?

Illustrations

Fig. number	Source
Cover	Secretariat of the Pacific Community (SPC) and Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), 2014, <i>Learning about Climate Change the Pacific Way: A Visual Guide – Vanuatu</i> . Accessed on 12 December 2014 at http://www.spc.int/images/climate-change/cc-project/Vanuatu-complete.pdf
1.	Pacific Climate Change Data Portal, Bureau of Meteorology, Commonwealth of Australia, 2015, <i>Annual rainfall at Peko Airport (Santo)</i> , accessed on 9 January 2015 at http://www.bom.gov.au/cgi-in/climate/pccsp/site_data.cgi?period=annual&variable=&nat_id=VUT&station=000003&ts_period=monthly
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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: <input type="radio"/> Competent <input type="radio"/> Not yet competent in this unit standard	Action to follow: <input type="radio"/> Assessor report to VRDTCA <input type="radio"/> Learner results and attendance certification issued
Learner's signature:	Date:
Assessor's signature:	Date:
Moderator's signature:	Date:

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