

**GRADE 10**

**SOCIAL SCIENCE**

**PROJECT 2: PLANNING THE FUTURE**

**Topic 1: Sustainable Global Development**

**Topic 2: Population Control**

**Topic 3: Environmental Safety**

**Topic 4: Cyclones and Flood**

**Topic 5: Drought and Famine in Africa**

**Topic 6: Monsoons in Asia**

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**Mr. Demas Tongogo**  
Principal-FODE

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## SECRETARY'S MESSAGE

Achieving a better future by individual students and their families, communities or the nation as a whole, depends on the kind of curriculum and the way it is delivered.

This course is part and parcel of the new reformed National curriculum. The learning outcomes are student-centred with demonstrations and activities that can be assessed.

It maintains the rationale, goals, aims and principles of the national curriculum and identifies the knowledge, skills, attitudes and values that students should achieve.

This is a provision by Flexible, Open and Distance Education as an alternative pathway of formal education.

The course promotes Papua New Guinea values and beliefs which are found in our Constitution and Government Policies. It is developed in line with the National Education Plans and addresses an increase in the number of school leavers as a result of lack of access to secondary and higher educational institutions.

Flexible, Open and Distance Education curriculum is guided by the Department of Education's Mission which is fivefold to:

- facilitate and promote the integral development of every individual
- develop and encourage an education system that satisfies the requirements of Papua New Guinea and its people
- establish, preserve and improve standards of education throughout Papua New Guinea
- make the benefits of such education available as widely as possible to all of the people
- make the education accessible to the poor and physically, mentally and socially handicapped as well as to those who are educationally disadvantaged.

The college is enhanced through this course to provide alternative and comparable pathways for students and adults to complete their education through a one system, two pathways and same outcomes.

It is our vision that Papua New Guineans' harness all appropriate and affordable technologies to pursue this program.

I commend all the teachers, curriculum writers and instructional designers who have contributed towards the development of this course.



DR. UKE KOMBRA, PhD  
Secretary

**Dr. Uke Kombra**  
Secretary for Education

**PROJECT 2: EXTENSION-PLANNING THE FUTURE**

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Dear Student,

Welcome to Project 2 an extension of the Grade 10 Social Science course Environmental Change, Pollution and Solutions.

This Project is called Planning the Future. It is about how we can sustain our livelihoods and at the same time maintain the ecosystem to support us and in the future. It is also about environmental safety and mining pollution in Papua New Guinea. The later parts of this project are about cyclones, floods, droughts and the Asian monsoon. Famines are a result of drought and other factors, and will also be discussed.

Thus, in this Project you will learn about:

- Sustainable Global Development
- Population Control
- Environmental Safety
- Cyclones and Floods
- Drought and Famine in Africa
- Monsoons in Asia

Topic 1 will be about Global Sustainable Development. You will discuss sustainable development through agricultural and community projects.

Topic 2 will be about Population Control. You will discuss population control and ways to help reduce population.

The third Topic will be about Environmental Safety. What is environmental safety and how can we make the environment a safe place to live and work in? We will look at the different ways to make the environment a safe and better place to work and live in, and for the future generations.

Topic 4 will be about Cyclones and Floods. You will discuss about floods and cyclones that occur in Papua New Guinea. You will study examples of these natural hazards that affect communities.

Droughts and Famines are most common in northeast Africa. Therefore in Topic 5, you will discuss about droughts and famines in affected areas of Africa.

In the last topic, you will discuss about monsoon seasons in Asia. Monsoons are rainy seasons common in Asia including Southeast Asia and the subcontinent of India. You will also discuss on other monsoons that occur in other parts of the world.

Each Topic has **lessons** with **Practice Exercises** and **Answers**. You must read each lesson and work through the Practice Exercises. You will have to correct your own answers. The answers to the Practice Exercises are given at the end of each topic. When you complete a topic, you will then complete the **Topic Test** in the Assignment Booklet. You will repeat the same process until you complete the Unit.

We hope you enjoy this Unit!

## STUDY GUIDE

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Follow the steps given below and work through the lessons.

- Step 1** Start with Topic 1 and work through it in order.  
**Step 2** When you complete Lesson 1, you must do Practice Exercise 1.  
**Step 3** After you have completed the exercise, you must correct your work. The answers are given at the end of each Topic.  
**Step 4** Then, revise well and correct your mistakes, if any.  
**Step 5** When you have completed all these steps, tick the check-box for Lesson 1, on the content page, like this:

**Lesson 1: Types of Changes in Papua New Guinea**

Then go on to the next lesson. You are to repeat the same procedure until you complete all the lessons in a topic.

**As you complete each lesson, tick the box for that lesson on the content page, like this . This will help you check your progress.**

### Assignment: Topic Test

When you have completed all the lessons in a Topic, do the Topic Test for that Topic, in your Assignment Booklet. The Unit book tells you when to do this.

### Marking:

The Topic Tests in each **Assignment** will be marked by your **Distance Teacher**. The marks you score in each Assignment will count towards the final result. If you score less than 50%, you will have to repeat that Assignment.

Remember, if you score less than 50% in three (3) Assignments, your enrolment will be cancelled. So, you are encouraged to do your work carefully and make sure that you pass all Assignments.

Here is a sample Study Timetable to use as a guide. Refer to it as a reminder of your study times. A timetable will help you to remember when you should be doing some of your FODE studies each day.

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8:00-10:00	<b>FODE STUDY TIME</b>				
10:00-11:00					
1:00-2:00					
2:00-4:00					
6:00-7:00					
7:00-9:00	Listen to or watch current affairs programmes. Write your diary, read a book.				

## Course Materials

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**Here is a list of resource materials that you will need for this course.**

- Grade 10 Social Science Project 2 course
- Project 2 Assignment Booklet

**Other materials to help you in your learning:**

- Ruler
- Pair of dividers
- Blank sheets of paper
- Pencil, eraser
- Exercise book

**Other References**

- Papua New Guinea School Atlas
- World Jacaranda Atlas

## **Chapter 1: Introduction**

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In Chapter 1, you will define and discuss Sustainable Global Development. You will discuss more on sustainable development through two case studies given. In most part of this chapter you will read about these case studies of sustainable agricultural projects in West Africa and in South and Central America. In the later part, you will define and discuss Millennium Development Goal (MDG), and study an example of how these Goals can be achieved through community projects set up and funded by the European Union (EU) and the United Nation's Development Programme (UNDP) in rural areas of Papua New Guinea.

In case study 1 you will read about cocoa farming in Cameroon and how it sustains livelihood in rural areas. This case study will also discuss how cocoa is best grown as well as how to identify the Black Pod disease that affects cocoa.

Case study 2 will discuss cocoa as a native crop to South and Central America and how it was brought by Europeans during colonialism to other tropical regions of the world. The case study will also discuss a workshop held in Panama on the usefulness of cocoa. Cocoa is a productive cash crop for millions of farmers in South East Asia, South and Central America, and West Africa.



## Chapter 1: Sustainable Global Development

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Welcome to Chapter 1 of Project 2. In chapter 1 you will study the definition of Sustainable Development and understand the reasons why applying it is important. There are many different definitions of Sustainable Development. However to help us understand this chapter on Sustainable Global Development, we will define sustainable development that will be looked at in our case studies.

### What is Sustainable Global Development?

There are many definitions of *sustainable development*, but the most widely used one is from the *World Commission on Environment and Development* in 1987 which defined sustainable development as

“...*development* that meets the needs of the present without **compromising** the ability of future generations to meet their own needs.”

### Definition of Sustainable Development

The word sustainability came from the Latin word *tenere*, to hold; *sus*, up. Dictionaries provide more than ten meanings for the word *sustain*, the main ones being to “maintain”, “support”, or “endure”.

This term was created by the **Brundtland Commission**. The Brundtland Commission officially disbanded in December 1987 after releasing the Brundtland Report, in October 1987, a document which created, and defined the meaning of the term "Sustainable Development".

**Sustainable development is maintaining a balance between the human need to improve lifestyles and feeling of well-being, and preserving the environment so that it is able to support an increasing population in the future.**

#### 1. What are the Benefits of sustainable development?

When we think about existing or new individual, business, industrial and community practices or projects we must make sure that we achieve economic, social and environmental benefits. Each person, business, and industry has a role and a responsibility to make sure we support our community in a sustainable way.

Given below is an example of these benefits.

<b>Economic</b>	<b>Social</b>	<b>Environmental</b>
-fish, agriculture farming -trekking	-tourism -improved living standards	-protecting plants and animals species like the leatherback turtle -planting mangrove trees

In terms of ecology being sustainable means shaping civilisation and human activity so that society, its members and its economies are able to meet their needs while conserving biodiversity and natural ecosystems.

## 2. *What are the Goals of sustainable development?*

The main goal of sustainable development is to achieve a realistic and fairly distributed level of economic happiness that can continue for many generations. It also suggests we use renewable natural resources in a way that does not reduce or damage their usefulness for future generations.

Sustainable development also requires us to use non-renewable energy resources at a slow rate.

Today, around 50 per cent of the present world population lives in urban areas. By 2050, twice as many people will live in cities as do today. Only through a sustainable living it is possible to reach the highest of all human goals, to be able to experience inner peace, happiness and harmony.

### **Why is Sustainability Important?**

Sustainable development is thinking about the different needs of the people and environment both now and in the future. Educating people about sustainable development is important.

"Education for sustainable development is about the learning needed to maintain and improve our quality of life and the quality of life of generations to come. It is about preparing individuals, communities, groups, businesses and government to live and act sustainably; as well as giving them an understanding of the environmental, social and economic issues involved. It is about preparing for the world in which we will live in the twenty first century.

Education for sustainable development enables people to develop the knowledge, values and skills to take part in decisions about the way we do things individually and as a community, both locally and globally, that will improve the quality of life now without damaging the planet for the future."

The following reasons state why sustainability is important.

#### *1. Our Future Depends on it*

Sustainability is important because all the choices we follow and all the actions that we make today will affect everything in the future. We need to make sound decisions at present in order to avoid limiting the choices of generations to come.

For example, if you continue wasting water and polluting the limited supply of freshwater that we have today, we leave future generations with no other choice than to **desalinate** saltwater or treat contaminated water for their consumption and daily use. We can also be certain that, if that happens, all life that depends on clean freshwater will become extinct.

The same goes with the supply of soil that we currently have. Without proper care, our soils can easily lose quality enough that they will no longer be able to encourage growth and sustain life. If that happens, future civilisations will not be able to have crops and other natural sources of food. They will then have no other choice but to create man-made sources for nourishment.

#### *2. Extinction will Prevail*

If clean water and good soil become scarce enough, all life on Earth can become extinct. Keep in mind that this does not just apply to soil and water but all elements of nature that are crucial to sustaining the Earth's natural balance.

In the past, the entire human population was small and civilisations had very few needs. At that time, natural resources seemed infinite because the capacity of nature to regenerate was much higher than the rate at which human beings used up resources.

### 3. *Time to Wake up*

Today, we are painfully beginning to learn that environmental resources are limited and are quite sensitive to everything that we do. We are starting to experience the effects of the actions of generations that came before us.

As we become aware, we need to put what we learn into action as that is the only way we can allow nature to catch up with the rate at which our requirements grow. This does not mean having to overpower human development. It means sustaining the supply of resources so that we can sustain human development.

With the world's population now over 8 billion and increasing all the time, the pressure on our planet, its people and resources is intense. Most people agree that we cannot continue to use these resources and abuse our environment as we have done in the past.

## **Natural Resource Sustainability**

What are Natural Resources?

Resources found in the environment, both renewable and non-renewable.

Natural resources like land and other raw materials can be found as naturally occurring substances. The value of these natural deposits depends on the amount available for mining. This means that if valuable resources exist in small amounts to be mined for profit or exist in a form that make mining very difficult then the value decreases as a result.

Each of us can do our part and make it count. The important lesson to learn is that “*our natural resources will not last forever at the rate that human society is using them up*”. Recycling, reducing waste generation, and conserving valuable resources are our best hopes so that our ecosystems will still be capable of providing for the generations to come.

For our case study the most frequent use of the term “sustainability” is linked to human systems in the study of the natural environmental system to help us as human beings to survive in our environment. Living a sustainable lifestyle is one way to help our ecosystem support the increasing world population.

## **Major Action Plan**

### *Agenda 21*

In 1992 the United Nations conference on Environment and Development was held in Rio de Janeiro in Brazil. Usually referred to as the Rio Earth Summit, one of its major outcomes, agreed by 180 of the world's leaders, was a blueprint for sustainable development. This action plan, beginning in the 1990's but going forward into the 21st century, is called Agenda 21. Agenda 21 looks at environmental, social and development issues and how they connect to one another. Formulating, agreeing and implementing plans and strategies for sustainable development are now a must for national governments.

Action is not just a must of national governments. All local authorities have to develop their own plans for sustainable development, based on local needs and the progress of partnerships between all sectors of the community, for example, businesses, voluntary groups and young people. Do you know what your local authority is doing?

**What is the Rio Earth Summit?**

The United Nations Conference on Environment and Development (UNCED), also known as the Rio Summit, Rio Conference, and Earth Summit was a major United Nations conference held in Rio de Janeiro from 3 to 14 June 1992.

**Blueprint refers to a plan, proposal or outline of something.**

Now do Activity 1.0. Check your answers at the end of Chapter 1.



**Activity 1.0**

1. What is the definition of sustainable global development?

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2. How is sustainable global development meant to be achieved now or in the near future?

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3. What is Agenda 21? How does it support the effort for sustainable growth?

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4. Explain what the Rio Earth Summit is. What was the reason behind such an important meeting?

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You have completed Activity 1.0. You will now look at two case studies on sustainable development activities.

### Introduction

The case studies are taken from studies conducted by *Focus On* of the International Energy Agency.

**Focus group: A focus group is a form of qualitative research in which a group of people are asked about their views and attitudes towards a product, service, concept, advertisement, idea, or packaging.**

We will also look at some examples of suitable methods applied by some organisations to make a difference by operating their businesses in a sustainable way.

In Case study 1 you will look at cocoa production in Cameroon a West African country. Cameroon has a population of 11 million people who depend on growing and the production of cocoa beans to sustain their income and general livelihood. Sustainable methods of agricultural practices are employed in small farms without causing destruction to their environment such as deforestation and soil erosion.

In Case study 2 you will look at sustainable agricultural practices in South America. In Cote d'Ivoire, legume trees are planted to protect and shade the cocoa trees, provide biological pest control and allow a greater diversity of plants, crops, insects and animals to flourish. You will also learn that companies bought cocoa directly from local growers and **co-operatives** that increased income for smallholder farmers.

### Case Study 1: Sustainable Agricultural Practices in Cameroon

The cocoa and chocolate industry is important to the livelihoods of many people and to economic growth and sustainable development in many countries.

With the global population set to double in the next century and economic growth, the demand for commodities will increase. The challenge is that can the small farmers meet these growing demands without further degrading the life support systems of the planet?

In Cameroon cocoa is planted within the layers of the rainforest, creating a system known as agroforestry.

Almost 70 percent of the world's cocoa is grown in West Africa, traditionally on small farms (up to 1100 trees per ha.). A third of the crop is lost every year through pests and diseases. Chemical spraying is often too expensive for farmers to buy and not particularly effective. Increasingly it is becoming clear that cocoa grows best under the canopy of other trees, with a range of other plants and trees.

### World Map showing West Africa and other Cocoa Growing Regions



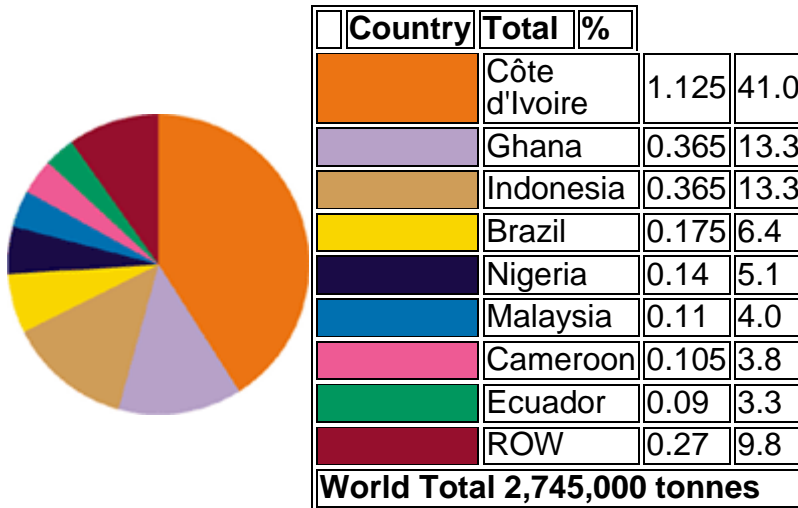
Illustration 10.2.2a: Cocoa has traditionally been grown in rainforest areas where logging activities have already cleared the land.



10.2.2b: Cocoa, agroforestry, Cameroon, showing tree layers

Cameroon produced 105,000 tonnes (3.8% of the world total) of cocoa beans in 1998. The varieties grown here produce a reddish coloured cocoa powder used in baking, biscuit and ice cream industries. Usually only the flavourless cocoa butter from Cameroon is used in the chocolate industry. Cocoa production is almost all on small farms. Yields are poor and heavy rainfall year round in some areas makes the cocoa prone to diseases and hard to dry in the sun.

### World cocoa bean production 1997-98 (in million tonnes)



Cocoa farms in some regions of Cameroon are found on selectively cleared forest land. When land is cleared, indigenous fruit, medicinal and timber tree species are left standing, for their economic value and to provide shade for cocoa trees. As a result, cocoa is grown in an **agro-forest**.

Food crops are needed to find ways of **propagating** the best varieties of these “companion” trees. The maize and melons are planted with the cocoa, and then more maize and cassava are planted while the cocoa trees develop. This system can be enriched by planting additional tree crops like mango, African plum, avocado, cola, orange, oil palm, coconut and rubber. This gradually develops into a closed canopy, multi-strata system similar to a natural forest.



Illustration 10.2.2c:  
Cocoa growing under  
the forest canopy  
(Agroforestry)

These cocoa agro-forests have the following advantages:

- they come close to the nutrient recycling system of a natural forest.
- they have nearly two thirds of the carbon stock of a natural forest - better than fallow land or food crop fields.
- they have greater plant biodiversity and **micro-fauna** than crop fields.
- they are economically more attractive (especially cocoa plus fruit trees) than other systems.

Work is underway to domesticate some of the native trees traditionally grown with cocoa to provide better timber and non-timber forest products

The biggest problem facing cocoa farmers in Cameroon is the fungal disease Black Pod. The chocolate industry is supporting research to help develop varieties of cocoa tree more resistant to the disease, enabling farmers to get better yields. Work is also beginning on using biological control systems to combat the disease. Fungi that are



Illustration 10.2.2d: Diseased  
cocoa pods



aggressive to the **Black Pod** fungus are isolated from the soil, grown up in culture and then sprayed on infected trees. The fungus then stops the growth of Black Pod fungus. This method avoids the use of expensive, inefficient and possibly environmentally damaging chemicals.

**Agroforestry is agriculture including the cultivation of trees.**

There is an increasing agreement that the future of cocoa production lies with sustainable smallholder agriculture. Using biological methods for controlling pests and diseases, and combined pest management practices can improve profitability and the quality of the product.

## Case Study 2: Sustainable Agricultural Practices in South America

### Introduction

The cocoa tree is native to Central and South America. The Mayans and later the Aztecs used cocoa beans to make bitter chocolate drinks. The beans were also used as currency. The Spanish explorer, Cortes, first brought cocoa beans to Europe in 1528. It remained a drink of the rich until the invention of the **hydraulic** cocoa press that brought major changes to processing.

J.S. Fry & Sons (Bristol) are credited with producing the first "eating chocolate". The first milk chocolate was produced in Switzerland in 1875 by adding powdered milk to the cocoa. By the 1930's, companies like Cadbury, Mars and Rowntree were mass producing a range of chocolate confectionery in the United Kingdom (UK). To meet this demand, cocoa trees were planted in South America and introduced into new regions of Africa and Asia. Cocoa is now a major source of income for 11 million farmers, mainly in South East Asia, South and Central America and West Africa.

### World map of (Central & South America) Cocoa growing regions of the world



Illustration 10.2.2e: Farmers leaving cocoa beans in the sun to dry.

### International Workshop, Panama

In 1998 the worldwide cocoa community (the chocolate industry, researchers, conservationists, NGOs and economists) met at the Smithsonian Tropical Research Institute in Panama to try to determine what sustainable cocoa production should be like.



The main findings were:

- cocoa farming has potential as a conservation tool.
- cocoa farming can make a positive difference to rural economies and lives.
- Research is needed to give small farmers environmentally friendly disease and pest control tools.
- Research into the role of the canopy and diversified farming models is important.
- factory practice improvement programmes are needed.

It was recognised that cocoa grown in the right way had benefits for the tropical environment compared to other crop systems, and it was a good cash crop for many smallholders. Some of the most interesting results on sustainable cocoa production presented at Panama came from the International Institute of Tropical Agriculture Humid Forest Station (IITAHFS) based at Yaoundé in Cameroon.

Now do Activity 1.1.



### Activity 1.1

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1. Briefly discuss case study 1 in two short paragraphs.

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2. How is cocoa grown best?

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3. According to the table and pie chart on cocoa farming in West Africa, which country had the highest percentage in production between 1997 and 1998?

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4. In your own words explain agroforestry.

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5. What is the biggest problem facing cocoa farming in Cameroon?

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6. How effective is the use of biological control in discouraging the growth of fungi?

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Check your answers at the end of Chapter 1.

Now, you will go on to looking at the support of the UNDP in terms of sustainable development in Papua New Guinea. But before we do so, let us define the **Millennium Development Goal**.

### **United Nation Development Programme (UNDP) Efforts on Sustainable Development in Papua New Guinea**

What is the Millennium Development Goal (MDG)? The MDG are the goals we must target to achieve sustainable development worldwide.

**The Millennium Development Goals (MDGs) are eight international development goals that were set up following the Millennium Summit of the United Nations in 2000.**

The Millennium Development Goals (MDGs) are the world's planned targets for addressing life-threatening poverty, mainly

- income poverty (people who do not have jobs do not earn wages)
- hunger
- disease
- lack of suitable shelter, and
- exclusion. They are also basic human rights, the rights of each person on the planet to health, education, shelter, and security.

So, what are these goals?

Here below are the eight Millennium Development Goals.



The world has made important progress in achieving many of the Goals.

- Between 1990 and 2002 average incomes increased by about 21 percent.
- The number of people in life-threatening poverty dropped.
- Child **mortality** rates fell from 103 deaths per 1,000 live births a year to 88.
- Life expectancy rose from 63 years to nearly 65 years.
- An additional 8 percent of people living in developing countries received access to water.
- And another 15 percent acquired access to improved sanitation services.

But progress has been far from uniform across the world, or across the Goals. There are huge differences across and within countries. Within countries, poverty is greatest for rural areas, though urban poverty is also widespread, and growing.

Sub-Saharan Africa is the **epicenter** of crisis, with

- continuing food insecurity,
- a rise of extreme poverty,
- high child and maternal mortality, and
- large numbers of people living in slums, and
- a big gap for most of the MDGs.

Asia is the region with the fastest progress but still millions of people remain in life-threatening poverty. Other regions have mixed records, particularly Latin America, and the Middle East and North Africa, often with slow or no progress on some of the Goals.

You have read about the Millennium Development Goal. Let us now find out more about the work of the UNDP in Papua New Guinea as part of its plans to achieve these Goals to bring about sustainable development.

Here is one example of many development initiatives funded by the UNDP in the different parts of the country.

### Example

#### Inspiring Change: Progress of EU-UNDP and Government Representatives in front of the future health centre



Port Moresby, February 13, 2015 – Representatives of the European Union (EU) Delegation in Papua New Guinea (PNG), Government and United Nations Development Programme (UNDP) visited Western Highlands and Jiwaka last week in order to assess the progress in applying the MDG Acceleration projects in the community

Rolling out in 2014, the trial initiative sets out to support community development projects by benefitting more than 5,000 villagers directly in four selected villages but creating indirect benefits far beyond, for an estimated 50,000 villagers.

During the two-day trip the delegation visited two out of the four supported communities, in Trolga village where the communities are building a health center and in Domil village, where a cassava feed mill and poultry processing plant are underway.

The Health Centre in Trolga stood in ruins until it received funds under the project for its renovation and completion. It will soon serve more than 8,000 people. The community has shown large commitment to the project and as part of its contribution purchased materials and begun the construction of the health center.

The Domil community is about to complete a cassava feed mill and a poultry processing plant. Production is expected to commence by May 2015. The project will mainly benefit 1,500 people but within two years, be extended to cover 40,000 people from neighbouring Jimi in North Waghi. As in Trolga, Domil has shown large commitment and organised farmers to engage in cassava and poultry production.

The delegation met and spoke with community leaders in both sites. Community leaders expressed deep appreciation for the support. “We have struggled for many years to make our dreams and vision of a self-sustaining, economically independent community happen. We are deeply grateful, that your assistance is provided directly at the grassroots level”, said John Waim, Chairman of the Domil Community Development Committee.

Sr Ruth Kumin, Officer in Charge of the Trolga Health Centre said: “We are so happy that we can now improve the quality of health services for the people of Trolga.” Mr Carlos Battaglini, EU Rural Economic Development Programme Manager was impressed with the community level initiative and commitment. He congratulated the communities on the progress: “Continue moving on with your initiatives and ownership. The European Union’s aim is to help improve the lives of the people in the rural areas and we are happy to partner with UNDP, the government and the community based organisations to assist you.”

“Projects like these remind us of the potential and commitment that exist at the local level. Communities are agents of change, and we hope they will inspire individuals and communities across Papua New Guinea to make their own positive changes. Officials at Provincial and District level note these initiatives (projects) and can support them through District Services Improvement Programme (DSIP)/ Provincial Services Improvement Programme (PSIP) funding. UNDP will continue to provide expertise, skills and knowledge for these kinds of initiatives”, said Roy Trivedy, UNDP Resident Representative.

EU Ambassador to Papua New Guinea, Martin Dihm, stated that the European Union “is pleased to assist communities directly through this important initiative. Our aim is to help making a real difference in the lives of people in the rural areas, where most of Papua New Guinea's people live.”

The Community-led MDG Development Project in Papua New Guinea is funded by the EU with a grant of one million Euros (about three million Kina) and implemented by the UNDP. On the Government side, the project is led by the Department of National Planning and Monitoring (DNPM). The main objective is to assist the Government of PNG to accelerate its achievement of the Millennium Development Goals (MDGs) at the local level which is still a critical constraint in this country. The project intends to **show** that four pilot communities are able to meet the MDGs and eventually to pave the way to replication on a larger scale.

Now do Activity 1.2.



### Activity 1.2

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1. What is the Millennium Development Goal?

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2. How do the MDGs support the call for sustainable global development?

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3. Outline some examples of the MDGs being achieved worldwide.

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Check your answers at the end of Chapter 1.

Now read the summary.



### Summary

You have come to the end of Chapter 1. In this chapter, you have learnt that:

- sustainable global development is about basic poverty and hunger; feeding, nurturing, housing, educating and employing 9 billion people; securing peace, security and freedom; and preserving the earth's life support systems in the next two generations.
- sustainable development means improving the quality of life whilst living in the carrying capacity of the supporting ecosystem.
- the Rio Earth Summit is the UNCED, which was a major United Nations conference held in Rio de Janeiro from 3<sup>rd</sup> to 14<sup>th</sup> June 1992.
- cocoa farming in West Africa is featured as an example of the development of sustainable agriculture.
- the cocoa and chocolate industry is important to the livelihoods of many people and to economic growth and sustainable development in many countries.
- that cocoa grown in the right way had benefits for the tropical environment compared to other crop systems, and was a good cash crop for many smallholders.
- the biggest problem facing cocoa farmers in Cameroon is the fungal disease Black Pod.
- the MDGs are eight international development goals that were established following the Millennium Summit of the United Nations in 2000, following the adoption of the United Nations.
- the MDGs are the world's planned targets for addressing extreme poverty in its many aspects.

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**NOW DO ACTIVITY 1. 3 ON THE NEXT PAGE**





### Activity 1.3

Read one of UNDP's development initiatives below and answer questions.

#### **UNDP to work with the Government of Papua New Guinea to establish early-warning systems to fight floods**



Port Moresby, 23<sup>rd</sup> April 2015 - UNDP in partnership with the Office of Climate Change and Development (OCCD) will start developing early-warning systems for inland and coastal flooding to enable local communities to cope with the floods and improve country's capacity to adapt to flood-related risks. The initiative will be carried out in five selected provinces: East Sepik, New Ireland, Morobe, Northern Province and Madang.

Currently, PNG's capacities to generate and distribute warning information for inland and coastal flooding almost do not exist due to the lack of suitable technical facilities and systems in place. For example, there is a lack of communication facilities at the provincial and district levels of government that would allow transmission of warnings to communities, especially the ones who live in remote areas. The procedures and protocols for early warning broadcast are also unclear and in most cases warnings do not get broadcasted through the communities. UNDP/OCCD-led initiative will focus on setting up an integrated early warning system by building technical and sophisticated warning systems and setting up responsive line of control for circulating warnings to communities, including the remote areas.

The main organisations such as PNG National Weather Service, Department of Environment and Conservation and National Disaster Center are expected to benefit. The improved climate information systems will support them in planning for, responding to and easing the impacts of floods and other extreme weather events. "By increasing the weather and climate information available to decision makers, this program will



enhance the ability of governments and communities of Papua New Guinea to prepare for extreme climate events build greater **resilience** and successfully adapt to a changing climate”, said Roy Trivedy, UNDP Resident Representative/UN Resident Coordinator in Papua New Guinea.

1. Write your answers in two short paragraphs.

What is the purpose of this development initiative? Where will this development initiative be carried out?

Paragraph 1

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Paragraph 2

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2. Who is involved in this development initiative?

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3. Why was it difficult to have the early-warning systems for floods established?

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4. How does the UNDP/OCCD intend to assist in the development of the early-warning systems for floods in the inland and coastal areas?

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5. How will the early-warning systems assist decision makers in their planning?

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**CHECK YOUR ANSWERS AT THE END OF CHAPTER 1**

## Answers to Activities 1.0-1.3

### Activity 1.0

1. Sustainable global development is...”development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”
2. People must be educated about what sustainable development is. Education for sustainable development enables people to develop the knowledge, values and skills to participate in decisions about the way we do things individually and as a group that will improve the quality of life without damaging the planet for the future.
3. Agenda 21 is an action plan, beginning in the 1990’s and going forward into the 21st century. It supports the efforts for sustainable development by looking at environmental, social and development issues and how they connect with one another.
4. The Rio Earth Summit was a major United Nations conference held in Rio de Janeiro from 3 to 14 June 1992. Its purpose was to discuss how countries should formulate plans to conserve the environment and bring about sustainable development in the long term.

### Activity 1.1

1. Paragraph 1 Case study 1 is about cocoa farming in Cameroon. It looks at how cocoa is planted within the layers of the rainforest, creating a system known as agroforestry. Cocoa production occurs all on small farms with poor yields and heavy rainfall making the cocoa susceptible to diseases.

Paragraph 2 In the Cote d'Ivoire, legume trees are planted to protect and shade the cocoa trees to provide biological pest control and allow a greater diversity of plants, crops, insects and animals to flourish.

2. Cocoa grows best under the canopy of other trees, with a range of other plants and trees.
3. Côte d'Ivoire
4. Agroforestry is about growing a crop, for example, cocoa with other trees on the same piece of land.
5. The biggest problem facing cocoa farmers in Cameroon is the fungal disease Black Pod.
6. The fungus is isolated from the soil, and grown up in culture then sprayed on infected trees.

### Activity 1.2

1. The MDGs are eight international development goals that were set up in 2000.
2. The MDGs are the world's planned targets for addressing extreme poverty, and it is mainly through these goals that extreme poverty can be reduced.
3.
  - Overall incomes increased by about 21 percent.
  - The number of people in extreme poverty dropped by about 130 million.
  - Child mortality rates fell from 103 deaths per 1,000 live births a year to 88.
  - Life expectancy rose from 63 years to nearly 65 years.
  - About 8 percent of people in developing countries received access to water.

-And an additional 15 percent acquired access to improved sanitation services.

### Answers to Activity 1.3

1.

#### Paragraph 1

The purpose of this development initiative is to start developing early-warning systems for inland and coastal flooding to allow local communities to cope with the floods and improve the country's capacity to adapt to flood-related risks.

#### Paragraph 2

This development initiative will be implemented in five selected provinces: East Sepik, New Ireland, Morobe, Northern and Madang Province.

2. UNDP in partnership with the OCCD
3. This is because these early-warning systems are non-existent due to the lack of suitable technical facilities and systems in place.
4. The UNDP/OCCD will focus on setting up an integrated early warning system by building technical and sophisticated warning system's base and establishing responsive line of control for distribution of warnings to communities, including the remote areas.
5. The improved climate information systems will support them in planning for, responding to and easing the impacts of floods and other extreme weather events.

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**YOU HAVE COMPLETED CHAPTER 1. NOW GO ON TO CHAPTER 2.**

## **Chapter 2: Population Control**

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In this chapter, you will learn about Population Control. In the first part of this chapter you will define and discuss population and population control and find out why it is important to study it.

You will also discuss on the general trend of the world population through interpreting graphs and texts on population.

In the later part of this chapter, you will discuss strategies to control population growth. Following that, you will deliberate on infant mortality and birth rates.

## Chapter 2: What is Population Control?

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Welcome to Chapter 2. In Chapter 1 you discussed about Sustainable Global Development through two case studies. You also defined and discussed Millennium Development Goals and discussed these Goals through an example of a community project in the Highlands. In this chapter, you will define and discuss population control.

### Population Control

So, now, let us begin our discussion. Let us ask ourselves, *What is population? What is population control?* Population is defined as “all the inhabitants of a particular place”. And, population control is any method used to control the type, location and number of people that live on earth. Population control is to keep steady the number of births and as a result control the growth of the world’s population. Now, what about human population control? Human population control is the practice of man using artificial or man-made technology to change the growth rate of the human population.

### Why Control Population?

With the world facing major crises relating to climate, energy, severe poverty, food shortage, and political instability, why should anyone be concerned about population? The simple answer is that nearly all of the major problems that confront the world today relate in some serious way to population growth.

World population is growing at about 80 million people a year, or about 220,000 people per day. If current trends continue, there will be 2.5 billion more people on the planet by mid-21<sup>st</sup> century, bringing the total to about 9.2 billion. That projected population growth raises a lot of questions about the future of the human race and the planet we live in.

In 2015, for the first time in history, over 1 billion people go to bed hungry every day. High food prices and the global economic **recession** have pushed 100 million more people into chronic hunger and poverty. And, looking ahead, we know that climate change, rising energy prices, and growing water scarcity will make it harder, not easier, to grow the crops needed to feed a growing population. Increasing soil erosion and the loss of farm land will also add to the challenge of boosting food production.

It is not just food that is in short supply. Water scarcity is a growing concern. In many parts of the world major rivers at various times of the year no longer reach the ocean. In some areas, lakes are going dry and underground water **aquifers** are being rapidly depleted. Climate change will make the water situation more serious. Drier areas will be prone to drought and wetter areas to flooding. As food, water, and other resources are strained by the rising demands of a growing world population the number of environmental refugees will rise and so will the potential for conflict and civil war.

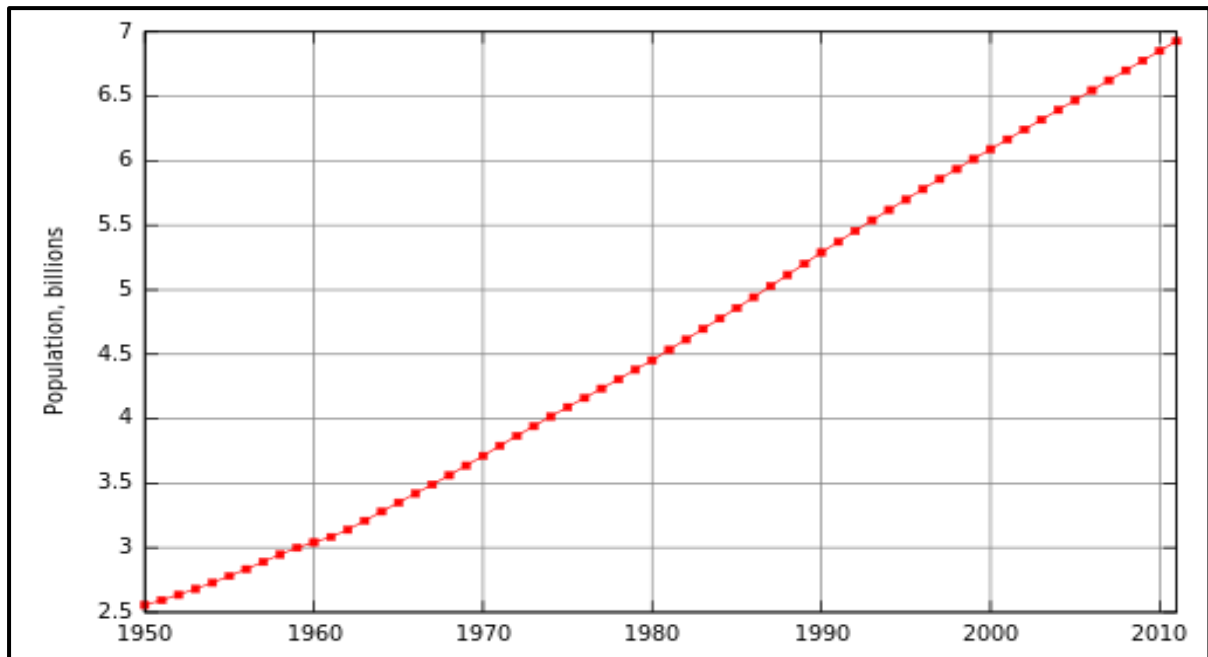
One simple strategy that will help to address all these problems is to provide universal access to voluntary family planning and reproductive health services. There are over 100 million women in the world who want to space or limit their pregnancies, but who lack knowledge of, or access to, modern methods of contraception. By educating and empowering women, and giving them access to family planning services, we can save lives, strengthen families, fight poverty, preserve the environment, and help achieve a world population that can live in harmony with the planet.

### Example of Population Growth

See below two line graphs that show the world population and its growth rate.

#### Graph 1

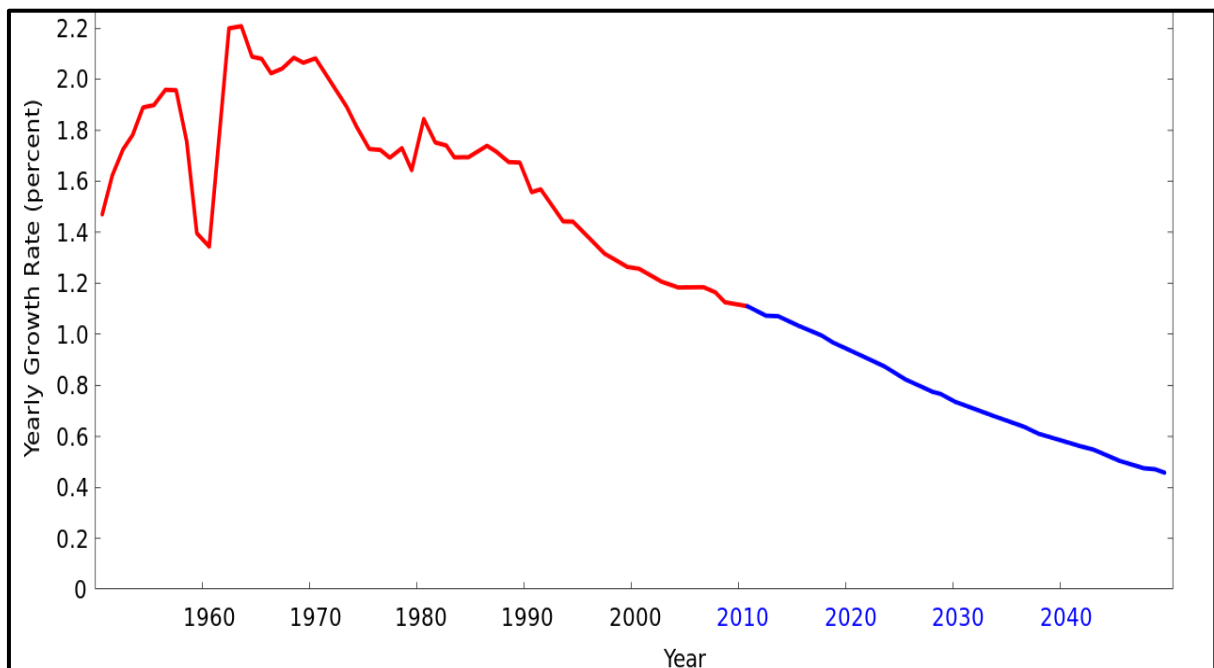
**World Population 1950-2010**



Now, compare graphs 1 and 2. Graph 1 looks at the world population between 1950 and 2010 whereas graph 2 shows the world population growth rate between 1950 and 2050. Graph 1 shows the population in a period of fifty years. Graph 2 shows the growth rate in a period of one hundred years. The projected growth rate in graph 2 was estimated to drop by 2010. However graph 1 showed the population to be on the increase since 1950 and continued in 2010 and beyond.

#### Graph 2

**World Population Growth Rate 1950-2050**



## **Strategies to Control Population Growth**

The population control movement was active worldwide throughout the 1960s and 1970s. This drove many reproductive health and family planning programs. In the 1980s tension grew between population control advocates and woman's health activists who said that women have reproductive rights which are part of their human rights. This means that the supporters believe that women can choose to have or not have children because it is their right too as human beings.

### **Strategy 1**

Population control may use one or more of the following practices although there are other methods as well.

- Contraception
- Abstinence
- Reducing infant mortality so that parents do not increase their family size to ensure at least some survive to adulthood
- Abortion
- Changing status of women causing departure from traditional sexual division of labour
- Sterilisation
- Legislation
- Family Planning
- Role Model a small family as the norm

The method(s) chosen can be strongly influenced by the religious and cultural beliefs of community members. While a specific population control practice may be legal in one country, it may be illegal or restricted in another.

Given here is one other method to help stabilise world population growth. *World Watch Institute* President Robert Engelman, in his book *State of the World 2012: Moving Towards Sustainable Prosperity*, outlines a series of steps and initiatives that could help in reducing birthrates. This is based purely on the intention of women around the world to have small families or no children at all. This as a result would end population growth before mid-21<sup>st</sup> century at fewer than 9 billion people. He wrote that unsustainable population growth can only be effectively and ethically addressed by empowering women to become pregnant only when they themselves choose to do so.

Examples of population control from around the world show effective policies that not only reduce birth rates, but also respect the reproductive hopes of parents and support an educated and economically active society that promotes the health of women and girls. Most of these reproduction policies are fairly low-cost to carry out, yet in many places they are opposed due to cultural beliefs and politics.

### **Strategy 2**

Engelman outlines nine strategies that could put human population on a naturally sustainable path:



- **Provide universal access to safe and effective contraceptive options for both sexes.** With nearly two in five pregnancies reported as mistimed or unwanted, lack of access to good family planning services is among the biggest gaps in assuring that each baby will be wanted and welcomed in advance by its parents.
- **Guarantee education through secondary school for all, especially girls.** In every culture women who have completed at least some secondary school have fewer children on average, and have children later in life, than do women who have less education.
- **Eradicate gender bias from law, economic opportunity, health and culture.** Women, who can own, inherit and manage property; divorce; obtain credit; and take part in civic and political affairs on equal terms with men are more likely to postpone childbearing and to have fewer children compared to women who are deprived of these rights.
- **Offer age-appropriate sexuality education for all students.** Data from the United States show that exposure to comprehensive programs that point out puberty, intercourse, options of abstinence, and birth control, and respecting the sexual rights and decisions of individuals, can help prevent unwanted pregnancies and therefore reduce birth rates.
- **End all policies that reward parents financially based on the number of children they have.** Governments can preserve and even increase tax and other financial benefits aimed at helping parents by linking these not to the number of children they have, but to parenthood status itself.
- **Integrate lessons on population, environment, and development into school curricula at many levels.** Schools should educate students to make well-informed choices about the impacts of their behaviour, including childbearing, on the environment.
- **Put prices on environmental costs and impacts.** In counting the cost of an additional family member by calculating taxes and increased food costs, couples may decide that the cost of having an additional child is too high, compared to the benefits of a smaller family that might receive government rebates and have a lower cost of living. Such decisions, freely made by women and couples, can decrease birth rates without any involvement by non-parents in reproduction.
- **Adjust to an aging population instead of boosting childbearing through government incentives and programs.** Population aging must be met with the needed changes in society, such as increased labour participation, rather than by offering incentives to women to have more children.
- **Convince leaders to commit to stabilising population growth through the exercise of human rights and human development.** By educating themselves on rights-based population policies, policymakers can ethically and effectively address population-related challenges by empowering women to make their reproductive choices.

If most or all of these strategies were put into effect, Engelman argues global population likely would peak and later begin a gradual decline before 2050, thereby ensuring sustainable development of natural resources and global stability into the future. By applying policies that defend human rights, promote education, and reflect the true economic and environmental costs of childbearing, the world can halt population short of the 9 billion.

### **Population Birth and Mortality Rate in Papua New Guinea**

According to the 2011 population census, the population of PNG increased by 40% at an average annual growth rate of 3.1 per cent since the last population census in 2000. During the same period the life expectancy at birth increased from 58 years to 60 years. Between 1990 and 2012 the infant and under-5 mortality rates decreased steadily from 65 and 89 per 1000 live births to 48 and 63 per 1000 live births. This decline does not help PNG to meet its MDG 4 target (refer to Chapter 1) as very few mothers deliver at health facilities.

In 2012 on average only 44 per cent of births occurred at health facilities. The maternal mortality ratio for PNG is estimated to be 230 per 100,000 live births. Whilst PNG has maintained its polio free status since 2000, there have been breakthrough measles outbreaks in 2005 and recently in 2013-2014.

**Communicable diseases** continue to be the major cause of **morbidity** and mortality, with malaria, tuberculosis, diarrhea and acute respiratory infections. Studies conducted by the PNG Institute of Medical Research (PNGIMR) indicate the occurrence of malaria to be on the decline. Tuberculosis (TB) remains a problem of public health with drug resistant types becoming common and extremely drug resistant (XDR) TB being reported in some areas. The number of pregnant women with HIV is steady at 0.56 per cent in 2013.

A 2007 Health report indicates that non-communicable diseases (NCDs) are widespread in PNG with adults more likely to develop chronic diseases. 77 percent of the population surveyed was at reasonable risk and 21 per cent at high risk for NCDs. According to the Household Income and Expenditure Survey (2010), 48 percent of children less than 5 years were much shorter than the number of population studied and weighed much less.

Challenges include a

- rapid population growth
- limited access to services
- high maternal mortality ratio
- dual burden of communicable and non-communicable diseases
- shortages of essential medicines
- insufficient funding for service delivery, and
- weak management capacity.

### **Effects of an increasing population in Papua New Guinea**

The table below shows the Papua New Guinea growth rate since 2011 Census and the 2014 estimated population figure.

<b>Papua New Guinea Population Growth Rate</b>	
Population:	6, 552, 730 (July 2014 estimate.)
Population Census 2011 preliminary results estimate:	7, 059, 653
2000 Census:	5, 190, 783
Population growth rate:	1.84% (2014 estimate.)

The indigenous population of Papua New Guinea is one of the most **heterogeneous** in the world. PNG has several thousand separate communities, most with only a few hundred people, divided by language, customs and traditions, some of these communities have engaged in low-scale tribal conflicts with their neighbours for many years.

A first-time growth of 1.8 million in Papua New Guinea's population over the last decade is alarming because of dangers of over-exploitation of fish and forest resources in the country.

Australian scientific group, **CSIRO**, has said in a report that PNG's growing population is an immediate threat to the region's sustainability than climate change. Incoming governments will be faced with a lot of pressure on its basic infrastructure like water and electricity as well as social services like healthcare and police.

It said that PNG depended a lot on foreign aid from Australia, which is its largest donor. The continuous population growth will increase demand on Canberra to increase its aid. It stated that PNG's rapid population jump would need to be addressed and controlled over the next 10 to 20 years before PNG loses control of its economic growth.

The Asian Development Bank (ADB) warned that PNG had one of the lowest per capita incomes in the island region despite a large mining and resource sector.

Now read the summary.



### Summary

You have come to the end of Chapter 2. In this chapter, you have learnt that:

- population control is any method used to control the type, location and number of people that live on the earth.
- human population control is the practice of using man-made technology to change the growth rate of the human population.
- the maternal mortality ratio is the ratio of the number of maternal deaths during a given time period per 100,000 live births during the same time-period.
- maternal mortality is the death of a woman while pregnant or within 42 days of termination of pregnancy.
- morbidity is another term for illness.
- morbidities are not deaths.

- PNG's rapid increase in human population is a problem the government must address
  - there are nine ways to control population.
- 

**NOW DO ACTIVITY 2.0 ON THE NEXT PAGE**

Now do Activity 2.0.



### Activity 2.0

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1. What is population control?

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2. What is the human population control?

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3. What were the nine strategies Engelman suggested would control population?

- (a) \_\_\_\_\_
- (b) \_\_\_\_\_
- (c) \_\_\_\_\_
- (d) \_\_\_\_\_
- (e) \_\_\_\_\_
- (f) \_\_\_\_\_
- (g) \_\_\_\_\_
- (h) \_\_\_\_\_
- (i) \_\_\_\_\_

4. Who did Engelman think have the power to reduce population? Explain.

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5. According to the report, which country is Papua New Guinea's largest aid donor?

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6. Briefly explain how Papua New Guinea's growing population is a threat to the region.

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**CHECK YOUR ANSWERS AT THE END OF CHAPTER 2**

## Answers to Activity 2.0

1. Any method used to control the type, location and number of people that inhabit the earth.
  2. The practice of using man-made technology to change the growth rate of human population.
  3.
    - Provide universal access to safe and effective contraceptive options for both sexes.
    - Guarantee education through secondary school for all, especially girls.
    - Eradicate gender bias from law, economic opportunity, health and culture.
    - Offer age-appropriate sexuality education for all students.
    - End all policies that reward parents financially based on the number of children they have.
    - Integrate lessons on population, environment, and development into school curricula at many levels.
    - Put prices on environmental costs and impacts.
    - Adjust to an aging population
    - Convince leaders to commit to stabilising population growth through the exercise of human rights and development.
  4. Women. He thought that by empowering women with education and awareness they themselves can choose when to have a child.
  5. Australia
  6. Its human population has increased very rapidly and it may soon face dangers of overuse in fish and forest resources.
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**YOU HAVE COMPLETED CHAPTER 2. NOW GO ON TO CHAPTER 3**

## **Chapter 3: Introduction**

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In Chapter 3, you will look at Environmental Safety. We will define, discuss and elaborate on the different aspects of environmental safety in our communities and around the world.

You will find out about the different human and physical impacts on the environment. You will look at case studies of the Ok Tedi mine in the Western Province, and how it has damaged the environment and livelihoods of communities. Natural disasters are also events that affect the environment.

In this chapter, you will read and discuss pollution in rivers systems, drought in the highlands by El Nino, and oil spill.



## Chapter 3: Environmental Safety

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Welcome to Chapter 3. In the previous chapter you discussed about population control. In this chapter, you will define and discuss on Environmental Safety particularly at the mines and its surrounding environs that are affected by mining wastes.

### What is Environmental Safety?

Before starting the lesson let us define environment. Environment is everything that is around us. Environmental safety is about how safe the work environment is; and how safe you are while working.

Environmental, health and safety departments also called Safety Health Environment (SHE) or Health Safety and Environment (HSE) departments are units commonly found within companies that think about environmental protection, occupational health and safety at work. These responsibilities are as important as providing quality products, and which therefore have managers and departments responsible for these issues.

EHS management has two general objectives: prevention of incidents or accidents that might result from unusual operating conditions and reducing adverse effects that result from usual operating conditions.

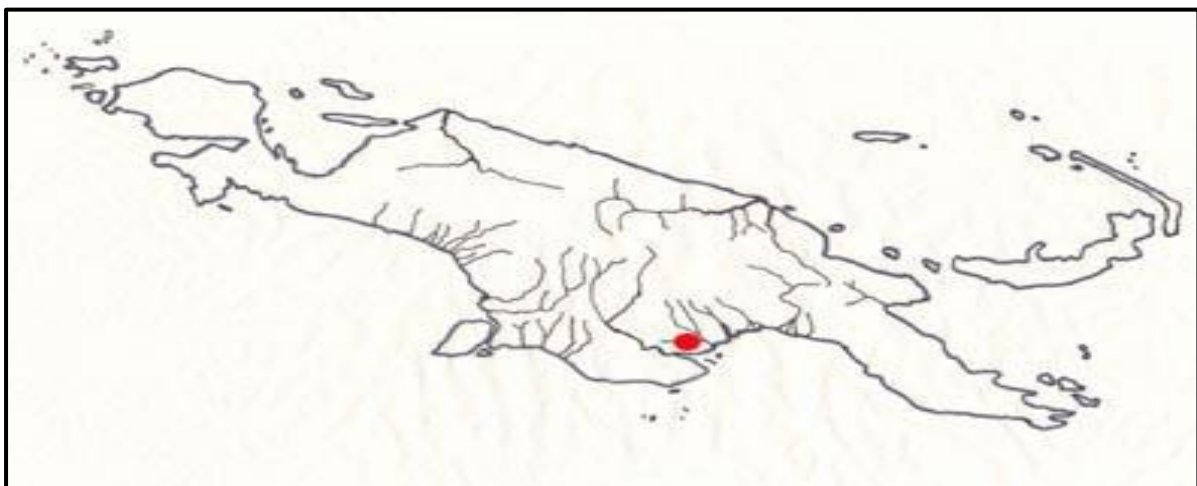
For example, fire, explosion and release of harmful substances into the environment or the work area must be prevented. Also action must be taken to reduce a company's environmental impact under normal operating conditions and to prevent workers from developing work related diseases.

### Case study 1: Pollution in river systems in Papua New Guinea

This case study will examine an environmental issue from three viewpoints, that is, in terms of globalisation, ecology, and economics.

#### History of Mining

European explorers first set foot in what is now known as Papua New Guinea in the early 16<sup>th</sup> century for its rich gold deposits. The following centuries saw the country divided into areas occupied by Germany and Britain to sustain their interests in Papua New Guinea's natural resources. Australia was very keen for Britain to colonise the country for trade reasons but Britain never established full governance. Papua New Guinea got Independence from European influences in 1975.



Map illustration 10.2.3a: Geographical location of Ok Tedi mine



Map illustration 10.2.3b: Ok area in the Western Province

Since then, Australia has led foreign mining industry activity mainly mining for gold, silver and copper, through resource company BHP Billiton. Gold and copper were the two main exports of Papua New Guinea at that time.

The Ok Tedi Copper mine in the Western Province is one of Papua New Guinea’s oldest and largest mines. Its history serves as a representation of mining in Papua New Guinea as a whole. Ok Tedi Mining Limited (OTML) had three shareholders: the PNG Sustainable Development Program Limited (52% which belonged to Broken Hill Propriety -BHP Billiton until 2002), the Papua New Guinea government (30%), Inmet Mining Limited (18%) from Canada.

As early as 1987, the first environmental surveys were carried out at the site. The surveys found that the **tailings** (rock waste) from the mine increased the sediment level and mineral content of the nearby Ok Tedi and Fly Rivers. A limit was then placed on the sediment output.

In 1993 BHP acquired a 60 percent share in the mine while the Papua New Guinea government and Inmet owned 20 percent each. A class action (legal action taken by a group of people with the same



Illustration 10.2.3c: The Ok Tedi mine in PNG is looking at ways to prevent waste from flowing into the Ok Tedi River (ABC) (Credit: ABC)

complaint) that included Ok Tedi and Fly River landowners launched an environmental case against Ok Tedi and BHP in the Victorian Supreme Court. The case was settled out of court with BHP agreeing to provide a package worth \$400 million to the landowners.

In the years that followed, environmental problems continued to occur at the site and surrounding areas. The PNG Sustainable Development Program Limited took the majority ownership from BHP Billiton in 2002 and the company admitted the mining waste had affected the livelihood of others along the river.

The company intended to shut the mine in 2012, leaving a permanently damaged river and fragments of communities that once existed on it.

- *Global Issues*

All mines in Papua New Guinea are at least partly owned by foreign resource companies such as BHP Billiton (Australia) and Inmet Mining Ltd (Canada). Other major players in Papua New Guinea mining industry were the UK and USA. The industry has had foreign investment in infrastructure and provided jobs to local people but with most profits flowing back to the foreign investors.

The influence of globalisation can also be seen in terms of exports. Most of the products of the mines are exported to other countries that do not have the same resources as Papua New Guinea.

In the Ok Tedi case, local landowners were able to start legal proceedings against the company in a foreign court (the Victorian Supreme Court) because the main shareholder at the time (BHP) had its headquarters in Melbourne. The class action therefore had access to Australian legislation for a local issue.

- *Ecological Issues*

The main ecological issue was mining waste that was dumped in the river. Tailings contained traces of copper, zinc, cadmium, lead and an estimated 80, 000 tonnes of these wastes were dumped in the rivers every day for two decades. Rivers are an important part of any ecosystem and the quality of the water is vital in keeping an ecological balance. The tailings poisoned an estimated 2000 square kilometres of forest and depleted fish stocks in both the Ok Tedi and Fly Rivers.

One of these developments has been the threat of acid rock drainage (ARD). ARD is acidic water caused by mining. Leakage of this water usually occurs at abandoned mine sites. If the acidic water enters the river systems it lowers the pH. This is then likely to result in damage to the rivers' ecosystem, that includes destroying plant life and reduce fish numbers.



Illustration 10.2.3d: Ok Tedi, river tailings



- *Economic Issues*

Mining has benefited the economy of Papua New Guinea in many ways. The industry brought foreign investment into the country, which in turn has created jobs and started infrastructure into isolated areas. The government had shares in some mining companies, which meant that the money from exports benefited the economy directly.

Due to the number of ecological problems and the damages sought against the Ok Tedi mine, BHP planned to close the mine in 2001. The Papua New Guinea parliament rejected this suggestion because of the importance of the mine to the Papua New Guinea economy. Instead, they phased out production, which was planned to end in 2012. BHP handed over its majority share in 2002 to the PNG Sustainable Development Program Limited.

While mining exports thrived, mines in all areas of the country had had a negative impact on subsistence farmers. Many farmers were left unemployed, which also exhausted the food supply.



Illustration 10.2.3e: Ok Tedi mine, Western Province, Papua New Guinea

Now do Activity 3.0.



**Activity 3.0**

1. What is Environmental Safety?

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2. What are the objectives of the Environmental Health & Safety (EHS)? Give an example.

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3. How did the local landowners and PNG government find out that copper production by OTML may have been causing pollution in the river as early as 1987? What measure was taken to reduce this amount of waste?

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Write the answers in a short paragraph each.

4. (a) What is a class action? Who took a class action against BHP? Why?

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(b) How was this dispute settled?

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5. Explain briefly the ecological issue of the OTML.

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Check your answers at the end of Chapter 3. Now you can go on and read case study 2.

### Case Study 2: Drought in the Highlands caused by El Niño

- *Overview*

In recent years the highlands of Papua New Guinea have experienced unpredictable weather patterns that have impacted on food production and security. The El Niño weather pattern has resulted in an extension of the dry season that normally runs from June-September, resulting in drought and shortage of food supplies. The people in rural areas are mainly affected by the impacts of drought as their traditional subsistence agriculture does not provide for such life-threatening weather patterns.

- *Project Aims*

The funding received from **Footprints** for the Drought and Farming Program is combined into a bigger program, Capacity Strengthening for Vulnerable Communities (CSVC) which aims to:

- Improve livelihood security and opportunities
- Empower target communities – through strengthening local capacity to act collectively; and
- Improve the level of service delivery- through greater community voice participation in local development

- *Activities*

Drought resistant varieties of crops were distributed in Andakombie Ward. With the additional **Footprints** funding **CARE** was able to expand support in three districts. Obura-Wonenara, Bena and Daulo, in the following Wards: Akuna, Ubo, Kundana, Sasuara, Barabuna, Megabo and Asaro. These communities all received drought resistant crop varieties of taro, yam and cassava. In addition, Footprints funding will support CARE'S partnership with the National Agricultural Research Institute (NARI), to undertake training on planting, harvesting, processing and storage of drought resistant crops.

Other supporting activities under this program in Obura-Wonenara included Peace and Reconciliation Trainings; it also assisted communities with coffee seeds and training; distributed fish eggs to support agricultural income generation; supported additional income generation activities for women's groups; started trainings and awareness in nutrition, HIV and AIDS, and Gender Equality; and supported the development of adult literacy schools and trained volunteer literacy teachers.

- Challenges

The National Agricultural Research Institute was originally thought of as a source of drought resistant yams – the specific crops the project identified as suitable.

Additionally, this is the first time these remote areas had received support of this nature and there had been a significant investment of time in working with communities to ensure they understood who CARE is, what is achievable within the project, managing expectations and especially planning with the communities to identify their needs and priorities.

- What next

Due to some of the time delays and the need for good planning, many of the activities funded by Footprints had been delayed until late 2009/ early 2010.

- About CARE

CARE is an international humanitarian aid organisation fighting global poverty, with a special focus on working with women and girls to bring lasting change to their communities. As a non-religious and non-political organisation, CARE works with communities to help overcome poverty by supporting development and providing emergency relief where it is needed most.

Last year, CARE assisted 122 million people across 84 countries through 1, 015 poverty-fighting projects.

Now do Activity 3.1.



### Activity 3.1

1. Explain briefly the El Nino weather pattern.

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2. According to this case study, which organisation funded the relief for El Nino in the highlands?

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3. How did Footprints hope to ease El Nino in the affected highlands areas?

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4. In addition to the above, what types of activities were carried out to assist the drought affected communities?

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5. What is the CARE organisation about?

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Check your answers at the end of Chapter 3. Now you can go on and read case study 3.

### Case Study 3: Oil Spills

Pollution from oil spills can have serious impacts on marine and coastal environments. Good scientific data are vital to effectively manage, monitor and minimise damaging environmental impacts.

- About oil spills

Oil spills can result in serious environmental pollution affecting communities that rely on the ocean for food, the fishing industry and tourism. The most direct effects are felt by marine animal and plants, big and small, which live in the path of the oil spill. Oil enters the world’s oceans from land-based sources, shipping incidents, offshore oil fields as well as from natural seeps from underwater **hydrocarbon reservoirs**. Once oil has entered the local environment, impacts will continue even after the visible oil has been removed.

- Environmental impacts

Oil, or hydrocarbons, can affect plants and animals in different ways. One of the most visually alarming physical effects on marine birds and mammals is through smothering, where oil coats the outside of their bodies, covering feathers and fur. A less obvious impact is a toxic response to the oil. Toxic compounds from the spilt oil can be swallowed by animals directly, in their prey, as they breath or as they clean their fur or feathers, causing short and long term negative impacts. These impacts can be difficult to measure. Oil can remain in sediments for many years, where it is very slowly removed by natural processes.

How long oil remains locked in sediments depends on the environment. For example, cold, low energy environments - those with little movement or water disturbance - are the slowest to recover.

Effective management of these incidents relies on information about what has been spilled, where it is likely to go, how long it will remain there and what organisms are in the spill path.



- Oil dispersants – the pros and cons

Dispersants are mixtures of chemicals that can break up liquids or gases into smaller particles which can then be spread over a larger area. Oil dispersants therefore do not change the amount of oil by themselves but they redistribute it. For instance, when used on fresh oil they can spread the oil from the surface through the water column. They can be used to change which parts of the environment are affected, moving the oil from affecting surface creatures and sensitive shorelines to the water column and sea animals in a deeper part of the ocean.

**Dispersants** spread the oil over a wider area, diluting it and reducing its immediate impacts through contact and smothering. But at the same time, spreading the oil as smaller particles may make it available for marine organisms to consume it. The **surfactants** (compounds that lower the surface tension of a liquid) used in most dispersants are toxic, but the oil and dispersant mixture is diluted through a much larger volume of water, when used in open waters, which often makes the mixture less toxic than concentrated oil. Also, many dispersants are petroleum based. With all this in mind, deciding to use dispersants is based on determining where the oil will do least harm: concentrated at the surface and on shorelines or spread through the water column. Using dispersants in the open water has the benefit of diluting the oil and so reducing local impacts. Dispersing oil increases the rate at which it is broken down by bacteria. Using dispersants in shallow water or in enclosed areas where dilution cannot occur can increase local environmental impacts.

- Natural Recovery

Once oil has reached the shoreline, physical removal and letting nature take its course are some of the few options available. In some situations, physical removal using detergents or high pressure hot or cold water can lead to more damage of shoreline habitat than the oil itself. Oil will eventually be broken down and dispersed by natural physical and biological processes.

- Evaporation

Oil is made up of a variety of hydrocarbons. Highly explosive, lighter components evaporate rapidly after the spill, leaving behind heavier crude oil. The remaining heavier hydrocarbons stay around longer and are harder to disperse. The rate of evaporation is affected by temperature, occurring faster in warmer temperatures.

- Effect of waves and tides

Waves also play a role in dispersing oil spills, diluting hydrocarbons in the water column and so reducing local impacts. Waves also make it harder to physically contain, remove or burn oil spills. Tides and currents will spread oil spills and slowly dilute the oil. Tides and currents may also make it harder to prevent oil from reaching sensitive areas.

- Microbes

Microbes play an important role in breaking down oil in sediments. While communities of microbes are affected by oil spills, some microbe species have the capacity to **biodegrade** hydrocarbons and so play a key role in returning the environment to a 'natural' state. This can be a slow process, where different components of oil are used up at different rates. In some instances, oil has been found in sediments many years after an oil spill event. Increasing the ability of the microbes to process hydrocarbons is one way to reduce the prolonged remains of spilled oil.

- Oil spill response

Good scientific data are vital to effectively respond to and manage oil spills. CSIRO will work with Australian Maritime Safety Authority (AMSA) to prepare for, and respond to, future environmental marine incidence. Effective management of these incidents relies on information about our marine environment.

Management decisions are made under high pressure and severe time constraints, so scientific advice must be accurate, properly delivered in time if it is to be of use in determining the most suitable response decision. CSIRO has a long history of collecting marine environmental information to inform local and national marine resource management.

Further information is collected by other scientists including research agencies, universities, consultants and the oil companies themselves. Collecting and organising this and future information, identifying major gaps, and making the data available would greatly assist response to major oil spills. Oil spill response in Australian territorial waters is coordinated by the AMSA.

Now do Activity 3.2.



### Activity 3.2

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1. How does oil spill affect animal and plant life in the sea?

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2. What is another way animals can be directly affected by oil spill?

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3. Briefly explain how oil dispersants spread oil.

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### Summary

You have come to the end of Chapter 2. In this chapter, you have learnt that:

- environmental, health and safety departments are found within companies that think about environmental protection, occupational health and safety at work.
- EHS management has two objectives: prevention of accidents that might result from abnormal operating conditions and reduction of adverse effects that result from normal operating conditions.
- the Ok Tedi Copper mine in the Western Province is one of Papua New Guinea's oldest and largest mines.
- all mines in Papua New Guinea are partly owned by foreign resource companies.
- the main ecological issue of the OTML was mining waste that was dumped in the river.
- the tailings poisoned an estimated 2000 square kilometres of forest and depleted fish stocks in both the Ok Tedi and Fly Rivers.
- mining benefits the Papua New Guinea economy in many ways.
- the El Nino weather pattern has resulted in an extension of the dry season that runs from June-September.
- the people in rural areas are affected by the impacts of drought.
- CARE is an international, non-religious and non-political humanitarian aid organisation fighting global poverty.
- pollution from oil spills can have serious impacts on marine and coastal environments.
- oil spills can result in serious environmental pollution affecting communities that rely on the ocean for food, the fishing industry and tourism.
- dispersants are mixtures of chemicals that can break up liquids or gases into smaller particles which can then be spread over a larger area.
- good scientific data are important to effectively respond to and manage oil spills.

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**NOW CHECK YOUR ANSWERS ON THE NEXT PAGE**

## Answers to Activity 3.0-3.2

### Activity 3.0

1. It is environmental protection, occupational health and safety at work.
2. -Prevention of incidents or accidents that might result from unusual operating conditions and reducing adverse effects that result from usual operating conditions.  
For example, fire, explosion and release of harmful substances into the environment.
3. In 1987, through the first environmental surveys. A limit was placed on the sediment output.
4. (a) A class action is a legal action taken by a group of people with the same complaint. The Ok Tedi and Fly River landowners took a class action against BHP because of the environmental damage caused by tailings being dumped into the river.  
(b) The case was settled out of court with BHP paying \$400 million to the landowners.
5. The main ecological issue was tailings being dumped in the river. The tailings poisoned an estimated 2000 square kilometres of forest and reduced the fish population in both the Ok Tedi and Fly Rivers.

### Activity 3.1

1. The El Nino is irregular weather patterns impact on food production and security in PNG. The El Nino weather pattern had resulted in a long dry season.
2. An international organisation called Footprints/CARE.
3. By combining the funding into a bigger program.
4.
  - Drought resistant varieties of crops were distributed.
  - The communities were trained on planting, harvesting, processing and storage of drought resistant crops.
5. CARE is an international humanitarian aid organisation that fights global poverty, with a special focus on working with women and girls to bring lasting change to their communities.

### Activity 3.2

1. Oil spill affects animal and plant life through coating (covering the fur/skin) and smothering.
2. Toxic compounds from the spilt oil can be consumed by animals directly, or in their prey, as they breathe or as they clean their fur or feathers.
3. Dispersants are mixtures of chemicals that can break up liquids or gases into smaller particles which can be spread over a larger area. Dispersants spread the oil over a wider area, diluting it and reducing its impacts through contact and smothering.
4. Natural recovery is the better solution. In some situations, physical removal using detergents or high pressure hot or cold water can lead to more damage of shoreline habitat (living environments) than the oil itself. Oil will eventually be broken down and dispersed by natural physical and biological processes.

5.

-Evaporation

Lighter oil components evaporate rapidly after the spill, leaving behind heavier crude oil.

-Effect of waves and tides

Waves also play a role in spreading oil spills, diluting hydrocarbons in the water and reducing local impacts.

-Microbes

Some microbes have the ability to biodegrade hydrocarbons.

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**YOU HAVE COMPLETED CHAPTER 3. NOW GO ON TO CHAPTER 4.**

## **Chapter 4: Introduction**

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In this chapter, you will define and discuss about cyclones and floods which are natural hazards. These natural hazards including landslides are common in Papua New Guinea and affect communities and cause damages to properties.

At the beginning of this chapter, you will define cyclone and flood and differentiate between the three types of floods. You will read case studies on occurrences of floods in Papua New Guinea's provinces of Western, Enga, and Southern highlands, Gulf, East Sepik, Central and Jiwaka.

Floods often lead to landslides and are a cause for concern when it results in deaths.

Case studies 1 and 3 will discuss floods and landslides in Wapenamanda, and in the Gulf.

In case study 2 you will read about the importance of the National Disaster and Risk Management Training programme in how they plan and assist affected communities when natural disasters occur.

Case study 3 will discuss commendations made by the Simbu Governor on the effectiveness of the Natural Disaster Office during heavy flooding and landslides in Simbu and in other provinces around the country.

Cyclones will be discussed in case study 5. Northern Queensland in Australia has frequent cyclonic activities. It is a region close to PNG that experience cyclones mostly.

## Chapter 4: Cyclones and Floods

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Welcome to Chapter 4. In the previous chapter you discussed about environmental safety mainly in environmental protection, occupational health and safety at work. In this chapter, you will define and discuss natural hazards such as cyclones and floods occurring in Papua New Guinea which affects livelihoods and cause damages to properties.

### Cyclone and flood

A cyclone is a system of winds rotating inwards to an area of low barometric pressure, with an anticlockwise (northern hemisphere) or clockwise (southern hemisphere) circulation. Another term for cyclone is tropical storm. The term cyclone is called different names in different places. It is also known as hurricane, typhoon, storm, super storm, tornado, or windstorm in different parts of the world.

Flood is a climatic event that results from heavy and prolonged rainfall which causes water level in rivers and streams to rise over the banks and the surrounding land to go under water. The term flood is also known as downpour or cloudburst in other places.

### Types of Flood

In Papua New Guinea there are three types of floods:

1. flash floods
  2. rapid onset
  3. slow onset
1. Flash floods occur with a few hours of very heavy rain with little or no warning and go away rapidly. This type of flood is most common in most parts of Papua New Guinea.
  2. Rapid Onset floods occur with several hours of heavy rainfall which can last for several days and are very much specific to medium sized river catchments.
  3. Slow Onset floods occur gradually over a fairly long period of time and are only characteristic of large river systems such as Sepik and Fly Rivers. Coastal flood is another type of flood which mainly occurs when storm surges, waves and/or very high tidal waves flooding low-lying coastal areas.

Floods can have both positive and negative impacts. They can bring welcome relief for people and ecosystems suffering from prolonged drought, but also are estimated to be the most costly natural disaster in Papua New Guinea.

Every year in Papua New Guinea, floods cause millions of kina damage to buildings and infrastructure such as roads and bridges as well as to agricultural land and crops. They also disrupt business and can affect health and school communities.

### Tropical Cyclone Intensity

Tropical cyclone intensity is defined by the maximum mean wind speed over open flat land or water. This is sometimes referred to as the maximum wind and will be experienced around the centre of the cyclone.

### Mean Winds and Gusts



**Mean Wind:** The mean wind speed is defined as the wind speed over a period of 10 minutes. It should be measured at 10 m above the surface.

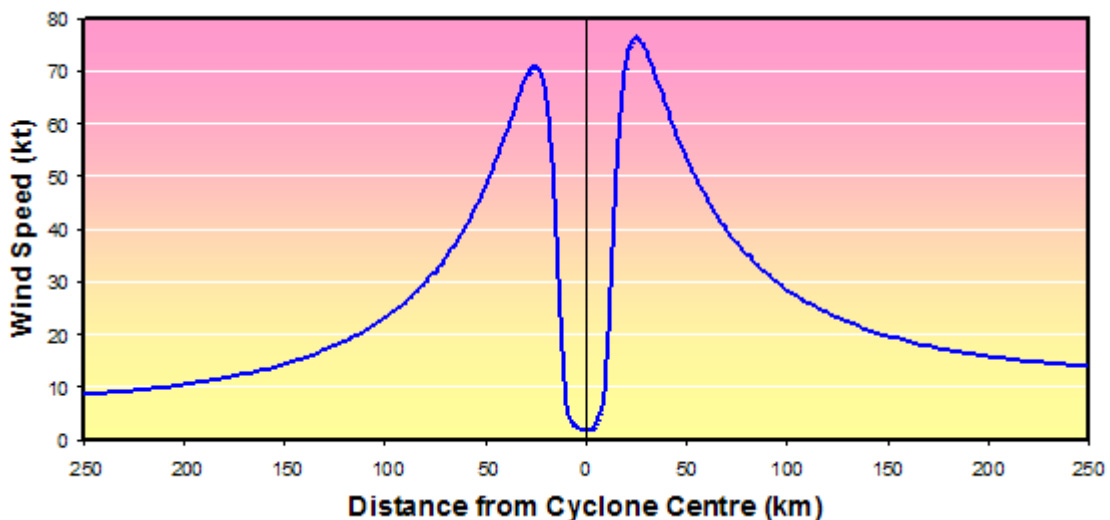
**Wind Gust:** In most of the world the wind gust speed is defined as the wind speed over 2 or 3 seconds.

**Normally gusts over open land will be about 40 percent greater than the mean wind and gusts over the ocean will be 25 to 30 percent greater than the mean wind. It is often the stronger gusts that cause the most major damage to buildings**

### Extent of winds

The extent of damaging winds will vary between cyclones. The most severe winds will most likely occur to a small area around eye (centre) of the cyclone. Often people will experience the winds in the outer part of a Category 4 or 5 cyclones. They will believe that they have experienced a major cyclone, yet the winds may have only been Category 1 or 2 strengths.

### Mean Wind Strengths for a Typical Tropical Cyclone



### Tropical Cyclone Category System

#### Category 1 (tropical cyclone)

Minor house damage; damage to some crops; trees and vans; and, yachts or small boats may drag anchor moorings.

A Category 1 cyclone's strongest winds are *gales* with typical gusts over open flat land of 90 - 125 km/h.

These winds relate to Beaufort 8 and 9 (Gales and strong gales) see Beaufort scale.

#### Category 2 (tropical cyclone)

Minor house damage; significant damage to signs, trees and vans; heavy damage to some crops; risk of power failure; and, small yachts or boats may break anchor moorings.

A Category 2 cyclone's strongest winds are *destructive* winds with typical gusts over open flat land of 125 to 164 km/h. These winds relate to Beaufort 10 and 11 (Storm and violent storm).

**Km/h is short for kilometre per hour.**

### Category 3 (severe tropical cyclone)

Some roof and damage to building structures; some vans destroyed; and power failures likely.

A Category 3 cyclone's strongest winds are *very destructive* winds with typical gusts over open flat land of 165 to 224 km/h.

These winds relate to the highest category on the Beaufort scale, Beaufort 12 (Hurricane).

### Category 4 (severe tropical cyclone)

Major roofing loss and damage to structures; many vans destroyed and blown away; dangerous debris in the air; and, widespread power failures.

A Category 4 cyclone's strongest winds are *very destructive* winds with typical gusts over open flat land of 225 to 279 km/h.

These winds relate to the highest category on the Beaufort scale, Beaufort 12 (Hurricane).

### Category 5 (severe tropical cyclone)

Extremely dangerous with widespread destruction

A Category 5 cyclone's strongest winds are *very destructive* winds with typical gusts over open flat land of more than 280 km/h.

These winds relate to the highest category on the Beaufort scale, Beaufort 12 (Hurricane).

## The Beaufort scale

Beaufort scale	Cyclone category	Average wind speed (knots)	Average wind speed (km/h)	Estimating speed over land	Estimating speed over water
0	Calm	Less than 1	less than 1	Calm, smoke rises vertically.	Sea like mirror
1	Light Air	1 - 3	1 - 5	Direction of wind shown by smoke drift, but not by wind vanes.	Ripples with the appearance of scales are formed, but without foam crests
2	Light breeze	4 - 6	6 - 11	Wind felt on face; leaves rustle; ordinary wind vane moved by wind.	Small wavelets, still short, but more pronounced; crests have a glassy appearance and do not break
3	Gentle breeze	7 - 10	12 - 19	Leaves and small twigs in constant motion; wind extends light flag.	Large wavelets; crests begin to break; foam of glassy appearance; perhaps scattered white horses
4	Moderate breeze	11 - 16	20 - 28	Raises dust and loose paper; small branches moved.	Small waves, becoming longer; fairly frequent white horses

Beaufort scale	Cyclone category	Average wind speed (knots)	Average wind speed (km/h)	Estimating speed over land	Estimating speed over water	
5	Fresh breeze	17 - 21	29 - 38	Small trees in leaf begin to sway; crested wavelets form on inland waters.	Moderate waves, taking a more pronounced long form; many white horses are formed (chance of some spray)	
6	Strong breeze	22 - 27	39 - 49	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.	Large waves begin to form; the white foam crests are more extensive everywhere (probably some spray)	
7	Near gale	28 - 33	50 - 61	Whole trees in motion; inconvenience felt when walking against the wind.	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind	
8	Gale	1	34 - 40	62 - 74	Breaks twigs off trees; generally impedes progress.	Moderately high waves of greater length; edges of crests begin to break into the spindrift; the foam is blown in well-marked streaks along the direction of the wind
9	Strong gale	1	41 - 47	75 - 88	Slight structural damage occurs (chimney pots and slates removed).	High waves; dense streaks of foam along the direction of the wind; crests of waves begin to topple, tumble and roll over; spray may affect visibility
10	Storm	2	48 - 55	89 - 102	Seldom experienced inland; trees uprooted; considerable structural damage occurs.	Very high waves with long overhanging crests; the resulting foam, in great patches, is blown in dense white streaks along the direction of the wind; on the whole, the surface of the sea takes a white appearance; the tumbling of the sea becomes heavy and shock-like; visibility affected
11	Violent storm	2	56 - 63	103 - 117	Very rarely experienced; accompanied by widespread damage.	Exceptionally high waves (small and medium sized ships might be for a time lost to view behind the waves); the sea is completely covered with long white patches of foam lying along the direction of the wind; everywhere the edges of the wave crests are blown into froth; visibility affected
12	Hurricane	3,4,5	64 and over	118 and over	Severe and extensive damage.	The air is filled with foam and spray; sea completely white with driving spray; visibility very seriously affected

Here are case studies of floods in Papua New Guinea and *Cyclone Nathan* in Queensland, Australia.

### Case Study 1: Wapenamanda affected by floods and landslides

Continuous heavy rainfall from 27-29 April 2013 caused many rivers to bust their banks and also triggered several landslides in Wapenamanda District and other parts of Enga province. These natural catastrophic events caused destruction to food and cash crop gardens, houses, schools, infrastructures, health and vegetation in the district.

The disastrous event was recorded as one of the worst disasters compared to other disasters of the past. It was associated with strong wind and landslides that affected food gardens, buildings, infrastructure such as bridges, and also other important facilities such as schools, health and economic projects in the district. An estimated population of forty 42,000 people were directly affected.

The Lai River is one of the tributaries of the mighty Sepik River. The river starts at Sirunki in Wabag District and flows down along Wapenamanda and then joins with the Sepik River. During the rainy periods, the rivers flooded and caused much destruction that affected the livelihood of more than 24,000 people. The effects of the upstream flooding were felt heavily by the people living along the Sepik River in East Sepik Province.

The National Disaster Centre deployed a Rapid Assessment Team to conduct damage and need assessment of the flood stricken areas in the district. The team discovered that there were extensive flooding and landslides in the district that affected lives of many citizens and the team recommended for immediate attention by the Government as many people are suffering.

Meanwhile, the National Disaster Centre released K1, 000,000.00 for disaster relief operation in the district. The cheque was presented to Hon. Rimbink Pato, Minister for Foreign Affairs & Immigration and Open Member of Wapenamanda Electorate.



Illustration 10.2.4a: Wapenamanda affected by floods and landslides. Topak Bridge affected by floods.

### **Case Study 2: National Disaster and Risk Management Training**

The National Disaster Centre through the Risk Management Division conducted training workshops in East Sepik, Oro and WNB Provinces. The Centre also provided 14 Introduction to Disaster Management and Initial Damage Assessments (IDM/IDA) trainings to provinces over the last five years. The trainings were held mainly to link it up

with national development strategies to bring disaster risk management into the planning processes, and also to build the abilities of the provincial officials to plan for, and respond to disasters and emergencies in a timely manner.

In November 2012, the National Disaster Centre conducted a week long training workshop for Milne Bay Provincial staff at the Masurina Lodge in Alotau, Milne Bay Province from 11 to 17 November 2012. The training workshop was attended by 43 senior officers from the provincial government and was officially opened by the Governor of Milne Bay, Honourable Titus Philemon.

During the official opening, Governor Philemon welcomed the NDC training team and participants and highlighted some of the challenges that Milne Bay Province is going through that are impeding development, service delivery including early warning and rapid responses to disasters and emergencies. He said communication and transportation are major issues that needs immediate attention and his Government will discuss with partners and stakeholders how to address these issues.



Sepik flooding

Governor Philemon told participants that Milne Bay province can become a lead province in Disaster Risk Management (DRM) as they have dedicated Public Service machinery and stakeholders including churches who can help realise this. The Governor challenged the participants to make DRM as an integral provincial developmental program and align it with Vision 2050.

The Assistant Director for the Risk Management Division of the National Disaster Centre, Mr. Kamnanaya said the training was a success as the participants were able to do an analysis hazards in the province, and were able to identify high risk districts in the province. The participants promised to set up DRM systems and arrangements at District and Ward levels commencing December 2012 and formalise the arrangements in 2013.

### **Case Study 3: Relief supplies go to Kerema flood affected communities**

The National Disaster Centre came to the aid of the Gulf Provincial Disaster Committee Office in providing emergency relief supplies to the flood stricken villages in the East Kerema LLG of Gulf Province.

Continuous heavy rainfall during the month of March 2013 caused extensive flooding in many parts of East Kerema LLG in Gulf Province. The heavy downpour caused the Tauri, Lakekumu and Kapuri rivers to overflow and inundated food gardens, water sources and buildings in the area. The Provincial Disaster Office in Kerema was informed of the situation but did not respond promptly so the affected communities themselves travelled to Port Moresby and reported the situation to the National Disaster Centre. The Centre then deployed a Rapid Assessment Team to East Kerema to confirm and verify the situation. The Rapid Assessment Team confirmed the situation

and later supplied K250,000.00 worth of relief supplies to affected communities in East Kerema LLG such as Isapepea, Uritai, Kukipi, Mirivase, Popo, Hamu Hamu, Miaru, Lesse, Iokea, Sepoe and Lelefiru .

**Case Study 4: Commendations for effective Relief Efforts by National Disaster Office.**

Simbu Governor Honourable Noah Kool commended the National Disaster Centre for effectively responding to disasters. He made the remarks during a cheque presentation at the National Disaster Centre. Governor Kool said many provinces in the country are experiencing various natural disasters frequently due to effects of 'climate change' and Simbu is one of the provinces that experiences natural catastrophic phenomena like flooding and landslips.

The Governor said, in early April 2013, there were extensive flooding and landslips in Gumine District and the response by the National Disaster Centre was very prompt. He said his office was surprised to know that the NDC Rapid Assessment Team was on the ground conducting damage and need assessment. He encouraged the Acting Director and his staff to continue with the same effort.

Governor Kool said his government has allocated K200, 000.00 for Disaster Risk Management in the 2013 Provincial budget. He added that this figure is not enough but it is just for the start to support the Provincial Disaster Office to come up with plans and other disaster risk management programs. The Governor said previous governors have never allocated any funding to support DRM programs, and the Provincial Disaster Office could not carry out its mandated tasks effectively. The Governor requested the National Disaster Centre to provide technical support and advice to develop disaster plans and other programs in his province.

Meanwhile, the Acting Director of the National Disaster Centre, Mr. Martin Mose thanked the Governor for the positive praises. Mr. Mose said this is the first time someone from a political level made such commendation about the Centre. He said the Centre with limited resources and manpower has responded effectively to many disasters. He said it also developed a couple of disaster risk management plans and programs but no one has ever made any positive comments about the Centre. Mr. Mose thanked the Governor who presented a cheque of K200, 000.00 for disaster relief operation in Gumine flood and landslide disaster.

**Case Study 5: Summary of Tropical Cyclone Nathan in Queensland, Australia**

Category 1 Nathan is moving steadily eastwards, away from the Queensland coast. Details of Tropical Cyclone Nathan at 10:00 am EST: Intensity: category 1, sustained winds near the centre of 75 kilometres per hour with wind gusts to 100 kilometres per hour. Location: within 55 kilometres of 13.0 degrees South, 148.5 degrees East, 419.0 kilometres southeast of Port Moresby, 329.4 kilometres south of Kupiano and 352.9 kilometres southwest of Alotau. Movement: east at 15 kilometres per hour. Hazards: Tropical Cyclone Nathan is intensifying as it continues to move eastward. Tropical Cyclone Nathan is expected to intensify into category 3 system and will track southwards along off shore of Queensland coast. Storm force winds over Central Province coastline and the gales over Daru, Kiwai Islands and Gulf Province will ease by tonight. However, gales over Central coastline and Southern Milne Bay Islands will

continue until Wednesday. Recommended Action for population along the mentioned coastlines should continue to remain alert and have their boats and property secured.

Now read the summary.



### Summary

You have come to the end of Chapter 4. In this chapter, you have learnt that:

- cyclone is a system of winds rotating inwards to an area of low pressure, with an anticlockwise or clockwise circulation.
- synonyms for cyclone are hurricane, typhoon, storm, superstorm, tornado, windstorm, and whirlwind.
- flood is a meteorological event that results from heavy and prolonged rainfall.
- synonyms for flood are downpour, tempest, and cloudburst.
- floods can have both positive and negative impacts.
- every year in Papua New Guinea, floods cause millions of kina damage to buildings and critical infrastructure and agricultural land and crops.
- floods also disrupt business, and can affect health, school and communities.

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**NOW DO ACTIVITY 4 ON THE NEXT PAGE**



### Activity 4.0

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1. Define the following terms:

(i) Cyclone

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(ii) Flood

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2. List the three types of flood and explain each one.

(i)

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(ii)

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(iii)

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3. List one positive and negative impact of floods.

Positive

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Negative

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**CHECK YOUR ANSWERS TO ACTIVITY 4 ON THE NEXT PAGE**

### Answers to Activity 4.0

1.
    - (i) Cyclone is a system of winds rotating inwards to an area of low pressure, with an anticlockwise or clockwise movement.
    - (ii) Flood results from heavy and prolonged rainfall, when the water level in rivers and streams rises over the banks and the surrounding land goes under water.
  2.
    - (i) Flash floods occur with a few hours of very heavy rainfall.
    - (ii) Rapid Onset Floods occur with several hours of heavy rainfall which can last for several days and are very much specific to medium sized river catchments.
    - (iii) Slow Onset Floods occur gradually over a fairly long period of time.
  3. Positive. Floods can bring a welcome relief for people and ecosystems suffering from prolonged droughts.  
Negative. Floods also are estimated to be the most costly natural disaster in Papua New Guinea.
- 

**YOU HAVE COMPLETED CHAPTER 4. NOW GO ON TO CHAPTER 5**

## **Chapter 5: Introduction**

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In this chapter, you will define and discuss the occurrence of Droughts and Famines in Africa. These natural disasters are common in parts of Africa that experience very little to no rainfall at all for long periods of time affecting large populations and communities at a time.

As a result, thousands of families and communities are affected requiring financial assistance and food provisions from international humanitarian organisations such as the United Nations Food and Agriculture Organisation (UNFAO). The FAO is an agency of the UN that fights global hunger and promotes rural development which began in 1945.

You will also do a case study on famine in parts of Kenya and Ethiopia in northeast Africa. The case study will discuss:

1. Causes of famine
2. Strategic responses
3. Underlying causes

## Chapter 5: Drought and Famine in Africa

Welcome to Chapter 5. In the previous chapter you learnt about natural disasters mainly cyclones and floods. In this chapter, you will define and discuss Droughts and Famines. A drought is a long dry spell with no rain and is a natural hazard most common in Africa. A famine occurs as a result of drought. Droughts cause crops and animals to die resulting in no food and water creating a famine.

### Defining Famine and Drought

Famine is extreme scarcity of food. In most cases it is drought that results in famine throughout a region.

According to Oxfam (2011), famine is a failure in terms of,

- (i) food production
- (ii) people's ability to access food
- (iii) the political response by governments and international donors.

Drought is a long dry spell with no rain. It is most common in Africa.

### Case Study 1

*World Development book case study: famine in the Horn of Africa, August 2011*

The United Nations defines food security as the ability of the population of a country or region to access sufficient food to meet their needs and ensure active and healthy lives. It uses a five-step scale to assess the level of food security and the fifth stage is famine/humanitarian disaster. That stage is only reached when malnutrition rates are,

- higher than 30 percent
- more than two people out of ten thousand die each day and
- when food is limited to less than 2,100 calories a day per person

### UN Five Step Scale of Food Security

- Phase 1 - generally food secure
- Phase 2 - moderately/borderline food insecure
- Phase 3 - acute food and livelihood crisis
- Phase 4 - humanitarian emergency
- Phase 5 - famine/humanitarian catastrophe

In late July 2011 the UN declared that two regions in Somalia, southern Bakool and southern Shabelle were experiencing famine and millions of other people in Kenya and Ethiopia were also threatened by the famine.



Illustration 10.2.4a: Children walk past an African Union Mission soldier from Uganda at a food distribution centre in Mogadishu.

### 1. Causes of famine in the Horn of Africa, August 2011

The causes of famine are not often easy to define and are usually the result of a number of factors. In Somalia, a two-year drought caused record food price inflation, with the price of red sorghum, a staple grain, increasing by 240 percent in a year. This was worsened by a harvest that was expected to be about half the normal size.

Many of the people in the affected region are herders and the drought has killed huge numbers of the animals that the herders depend upon for food and a source of income. In the worst-affected areas up to 90 per cent of the animals have died. With rising food prices and a reduced source of income, families are in a desperate situation. Farmers from the grain-growing areas of Somalia fled from the drought. In 2010 the main rainy season was very good, and resulted in a plentiful harvest. However the increasing effects of drought in previous years and the internal conflict between the Islamists and other opposing groups within the country quickly dissipated the food crop and prices rose very sharply. According to the **UNFAO**, farmers used the profits from the harvest to pay off debts and kept enough grain to last until the new rains in April – which failed to arrive.

The persistent drought intensely reduced food production and the rising food prices made it impossible for many people to access the food supplies that are available. It was also the inability of Somalia's government to implement strategies to reduce poverty. It was as well the failure of donor countries to invest properly in a region where there is barely any basic infrastructure that has turned the situation into a famine.

Here is a quote by Luca Alinovi, a UNFAO official in Nairobi, who says,

'How can we have people dying like flies of hunger in 2011? It is so unacceptable. Famine is a Middle Ages issue.'



Illustration 10.2.5b: Tens of thousands of people in Somalia fled the famine in search of food.

### 2. Strategic Response

For many people, the first time they became conscious of this was 1985, when Michael Buerk produced a famous television report from a refugee camp in Ethiopia that aroused a

first-time response in the Western world and eventually gave rise to **Live Aid**. An important outcome was a famine early warning system created by the US. The early warning system monitors many factors, including climate and food prices in local markets, and offers the opportunity to warn of problems long before they occur, allowing time for governments and policymakers to respond.

### **3. Underlying Causes**

#### **(i) Type of climate and drought in East Africa**

In all of the cases of food shortage since 1985 there have been difficult physical conditions due to a largely arid region that often experiences long periods without rain.

There were some people who mentioned climate change as a major cause of this famine. An examination of the climate of the Horn of Africa suggested that historically there was an approximate 10-year cycle of severe drought. In the last 30 years drought happened far more frequently and since 2000 it was practically every year. Rainfall patterns have become less predictable and the area that received between 500 and 600 millimetres (mm) of rain a year has shrunk greatly. Whether this was due to a natural difference in climate conditions or human-made climate change cannot be answered definitively but there were many who were convinced that the human impact on climate will make life much more difficult in regions like this.

Here is a quote by Daniele de Bernardi, co-ordinator of the UN FAO in Nairobi, who says, 'We can't say for sure that this is global warming, or part of a historical cycle, but there is definitely a change occurring.'

#### **(ii) Conflict within**

The other common factor was conflict which prevented effective agriculture and agricultural development. That was certainly the case in Somalia at that time.

The governments of Somalia and Kenya and aid donors were criticised for not reacting quickly enough to warnings about the impending food crisis that were first sent to governments and aid agencies in October 2010. Little was done until the crisis blew up after the April rains had clearly failed. Donors reacted too late and too cautiously. According to United Nations figures, \$1 billion was required to meet immediate needs in the region and donors had committed less than \$200 million, leaving an \$800 million shortfall.

The situation in Somalia caused the US to invade it in December 1992. Some 28,000 US troops entered the country under a UN directive to bring humanitarian aid to starving people. The then President George H Bush said in a televised address to the American people that the troops were 'doing God's work'. However, many Somali people saw the US troops as invaders and this resulted in constant fighting in populated urban areas. Over 10,000 Somalis died at the hands of US troops over a period of 10 months. This 'Battle of Mogadishu' saw two Black Hawk helicopters being shot down and dead US troops displayed in the streets. By March 1993, the US withdrew all of its troops from the country and left only the UN to face a worsening situation.

#### **(iii) Islamic influences in Ethiopia**

US interest in the country was re-awakened after 9/11 when Somalia was seen as a failed state that harboured Islamic militants. Over the last decade the US supported an invasion by Ethiopian troops to displace a functioning broad-based Islamic government. This action by the US resulted in increased conflict and instability.

With no government able to impose its influence for 20 years, the country's infrastructure rotted away, and development assistance was the least compared with other countries. Warlords held control for a few years until a broad-based Islamic movement known as the Islamic Courts Union took control of Mogadishu and quickly spread its influence. Ethiopia, backed by the US, invaded the country to throw out the courts, which it accused of terror links. Out of the remnants of the ICU rose the far more extreme al-Shabaab militia, this group controlled most of southern Somalia. The group, which is not homogenous, has links to al-Qaeda and is opposed to western influences.

In 2009, it started expelling aid agencies from its territory, including the World Food Programme, and those organisations that remained were unable to use expatriate staff because of the security risks. Furthermore, the terror links meant that the US, the world's biggest donor, was desperate not to allow any of its fund to get into al-Shabaab hands, so its aid funding to Somalia was significantly cut.

— Xan Rice, *The Guardian*, 8 August 2011



Illustration 10.2.5b: Distributing food rations in East Africa, 2011 (Photo by Expert Infantry under a CC license)

Some governments and aid organisations blamed al-Shabaab for difficulties in getting food aid into Somalia and increasing the number of refugees. The Islamist rebel group, which controlled most of south Somalia, including the main famine zones, refused to lift the bans it has forced on several humanitarian agencies over the past two years. One of the barred organisations is the World Food Programme, which usually leads drought responses. The inability of some organisations to gain access to the worst-affected areas was a factor in the worsening of the situation in the country but several other international aid groups, including Islamic Relief, UNICEF and the International Committee of the Red Cross (ICRC) operated across the al-Shabaab-controlled zones, including other Somali NGOs. These agencies claimed that the major problem in responding to the crisis was the time it took to buy food abroad and transported to the worst-hit areas.



#### (iv) No Effective Government

In the absence of effective government, the Transitional Federal Government in Mogadishu was weak, overstaffed and deeply corrupt. Somalia became the ultimate free market, and food imports zone. In the al-Shabaab areas, the imported rice and pasta were too expensive for many. With no government, and little or no aid getting in, people started going hungry. Then hunger turned to starvation, and thousands of people left their homes each day, and headed for the refugee camps in Kenya, Ethiopia or Mogadishu. They went anywhere where food relief was available. — Xan Rice, *The Guardian*, 8 August 2011

Many of the refugees from Somalia went to the Dadaab Camp in northern Kenya.

Dadaab Camp



Illustration 10.2.5c: Used food tins lie near a field hospital of the International Rescue Committee (IRC) in Dadaab, Kenya, on Tuesday, July 26, 2011. (AP Photo/Schalk Zan)

#### (v) Dadaab Camp in northern Kenya

In August 2011 the population of Dadaab refugee camps was estimated at 400,000 with another 38,000 refugees waiting to be registered by the UN refugee agency. The size of its population makes it Kenya's third-largest city and the world's largest refugee settlement. The population grew by an estimated 1,400 people a day and the rapid spread has a predictable negative impact on the environment. The camp is in an open arid area on the edge of the Ogaden desert 400 kilometres northeast of Nairobi.

The camp was originally opened in 1991 when the Somalis first fled from war and drought in their homeland and was designed for 90,000 refugees. As the intensity of civil war in Somalia increased and living in the country became more dangerous, the numbers increased dramatically. Around 130,000 refugees have reached the camp since the start of 2011. The scale of the refugee crisis has created tensions between the refugee agency and Kenyan government which has become increasingly concerned by the impact of the camp on the local community and the perceived threat from al-Qaeda rebels within Somalia. They were reluctant to allow the opening of a new camp (Ifo2) which was built in late 2010 to accommodate 40,000 people. The new camp had schools, toilets and water towers but the Kenyan government initially refused to allow it to be opened, fearing that it would make the camp more permanent. They wanted the Somali refugees to be cared for on Somali soil.

[The Kenyan government eventually granted permission for the new site to be opened to refugees on 18 August 2011.]



The result had been the growth of a camp of tents and latrines that extended further and further away from water supplies and toilets and also away from protection and security. When the camps were first built, water could be reached by drilling borehole 10 metres into the ground. Today, the boreholes have to be 200 metres deep to reach water as demand has lowered the water table; the situation is clearly unsustainable. Vegetation and tree cover has been drastically reduced in the region as refugees have to search wider and wider for firewood.

Some of the refugees have been living in the camp for 20 years and an economy has evolved that gives many people some form of employment. The camp causes resentment amongst local Kenyans who have also been affected by the drought and by decades of underdevelopment. They believe that the refugees receive better services from the aid agencies than they do and the single-storey brick houses built in Ifo2 were better than the houses of millions of poverty-stricken Kenyans.



Somali men carry a severely malnourished child, under the instruction of a African Union Mission in Somalia (Amison) peacekeeper, from a camp for internally displaced people to the peacekeeping operations headquarters where the child was admitted for emergency medical treatment, in Mogadishu, on July 15, 2011.

(Reuters/Stuart Price/AU-UN IST PHOTO)

#### (vi) Who is Al-Shabaab?

Al-Shabaab – meaning ‘The Youth’ in Arabic, are believed to be the largest group among several Islamist and clan militias battling the transitional government in Somalia. The group was formerly the military wing of the overthrown Islamic Court Union (ICU) that controlled much of central and southern Somalia in late 2006. However, they were forced out of Somalia by Ethiopian troops in support of the largely powerless UN-backed interim government.

The group refused to engage in the peace process that brought elements of the Islamic courts into the government. Sharif Ahmed, a former leader of the ICU, was sworn in as president of Somalia’s government, but his former allies vowed to topple him, accusing him of betraying the country.

Al-Shabaab is led by Muktar Ali Robow, also known as Abu Mansoor, who was previously the Islamic courts’ deputy defence secretary. Since Sharif’s government took power, al-Shabaab has been waging a brutal war against Somalia’s government forces.

The photograph below shows a mother being checked for malnutrition at a nutritional centre in rural Kenya.



Illustration 10.2.5d: A mother is measured to see if she is malnourished at a nutritional centre in Turkana, Kenya, on July 15, 2011. (Reuters/Kate Holt/UNICEF)

Now read the summary.



### Summary

You have come to the end of Chapter 5. In this chapter, you have learnt that:

- famine is when food is extremely scarce in a particular place.
- drought is a long dry spell with no rain and is most common in Africa.
- there are causes of famine which usually result from a number of factors.
- United Nations defines food security as the ability of the population of a country or region to access sufficient food to meet their needs and ensure active and healthy lives.
- it uses a five-step scale to assess the level of food security and the fifth stage is famine.
- the fifth stage is only reached when malnutrition rates are higher than 30 percent, more than two people out of ten thousand die each day and when food is limited to less than 2,100 calories a day per person.

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**NOW DO ACTIVITY 5 ON THE NEXT PAGE**

Now do Activity.



### Activity 5.0

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1. What is famine?

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2. Explain, in your own words, how you think famine is caused?

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3. Where in the world are famines common?

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4. What are the three factors that define famine?

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5. How does the United Nations define food security?

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6. How does the UN assess the level of food security?

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7. What is the UN's five step scale to food security?

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8. What is drought?

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**CHECK YOUR ANSWERS TO ACTIVITY 5 ON THE NEXT PAGE**

### Answers to Activity 5.0

1. Famine is when food is very scarce.
  2. Famine in most cases is caused by a long period of drought throughout a region.
  3. In parts of north and east Africa like Ethiopia, Kenya, Djibouti, Somalia.
  4.
    - (i) food production,
    - (ii) people's ability to access food
    - (iii) the political response by governments and international donors.
  5. The UN defines food security as the ability of the population of a country/region to access sufficient food to meet its needs and ensure active and healthy lives.
  6. The UN uses a five-step scale to assess the level of food security.
  7. The UN five step scale of food security is:
    - Phase 1 - generally food secure
    - Phase 2 - moderately/borderline food insecure
    - Phase 3 - acute food and livelihood crisis
    - Phase 4 - humanitarian emergency
    - Phase 5 - famine/humanitarian catastrophe
  8. Drought is a long dry spell with no rain. It is most common in Africa.
- 

**YOU HAVE COMPLETED CHAPTER 5. NOW GO ON TO CHAPTER 6**

## **Chapter 6: Introduction**

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In this chapter, it will be based on case studies of Monsoons in Asia. The Monsoon is very important to farming in the subcontinent of India and the Asia and the people depend on it for their crops and their livelihoods.

The effects of the Monsoon are also felt in Papua New Guinea.

## Chapter 6: Monsoons in Asia

Welcome to Chapter 6. In this chapter, you will define and discuss Monsoons in Asia. In the last chapter, you discussed about famines and droughts in Africa.

You may have heard about the Asian monsoon but do not have much idea about what it is, and or, how it begins. You will now learn more about this monsoon season and how it affects the Asian way of life and also ours here in Papua New Guinea.

### What is Monsoon?

1. Monsoon is a prevailing wind that occurs in seasons in the region of South and South East Asia. It blows from the south-west between May and September and brings rain (*wet monsoon*), or from the north-east between October and April (*dry monsoon*).
2. Monsoons are massive, changing sea breeze movements that form due to temperature differences between land and ocean.

### Circulation of Monsoon

You can see below a diagram showing a monsoon.

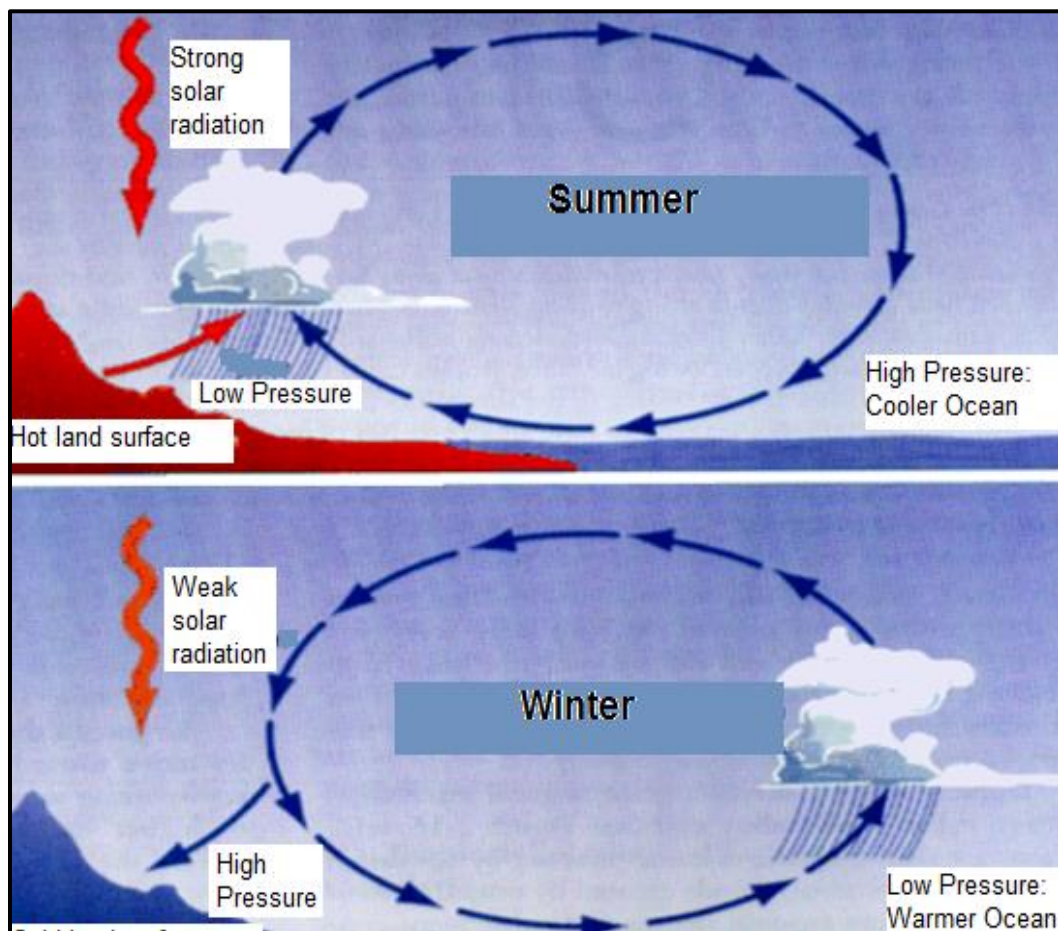


Figure 10.2.6a: How a monsoon forms

A monsoon is a change in the prevailing wind direction. When this occurs it brings with it a different kind of weather. It almost always refers to the Asian monsoon, a large region extending from India to Southeast Asia where monsoon conditions prevail.

During the winter monsoon a large high pressure zone over Asia drives cool, dry air southward toward the tropics. This provides the monsoon region with its dry season.

Then during May and June of each year, the summer monsoon arrives with a southerly wind flow driven by a warm air mass with low pressure that forms over southern Asia. Air from the high pressure air mass over the Indian and tropical western Pacific Ocean flows northward toward the low pressure over land, bringing heavy rains. A late arrival of the monsoon can be bad for agriculture, as the monsoon rains are necessary for summer crops.

In India, for example, the dry northerly wind flow over India changes direction, and warm humid air from the Indian Ocean flows from the south, gradually spreading over the Indian subcontinent. Widespread heavy rains, and even severe thunderstorms, large hail and tornadoes can accompany the arrival of the summer monsoon.

The Indian Ocean version of the hurricane, which is traditionally called a "cyclone" in the Indian Ocean, can also form and move ashore with the arrival of the monsoon. These cyclones have at times killed many thousands of poor people who live in the low-lying areas along the eastern coast of India and Bangladesh.

A weaker monsoon occurs over the dry southwestern United States in the late summer when more humid air spreads over the region.

Monsoon season is a welcome relief to drought conditions in many areas of the world. Monsoons can also bring about widespread famine and enough rain to kill hundreds of people in floods. While the Asia and India monsoons are famous, there are even monsoon seasons in the United States.

Monsoons, or rainy seasons, are a change in wind direction which causes a lot of rainfall in many parts of the world including Asia, North America, South America, and Africa. The major tool behind a monsoon is a change in global wind patterns.

A monsoon is not just any heavy rain that lasts for a long time. A monsoon is like a giant sea-breeze. A normal sea breeze changes daily, with the day-to-night change of land temperature as the sun rises and sets; monsoons change in seasons. Illustration 10.2.6a compares seasonal changes in the monsoon air movement. During the summer, the land is warmer than the ocean. This causes air to rise over the land and air to blow in from the ocean to fill the space. The rising air forms cloud and finally rain. These monsoon clouds that form are full of moisture from the ocean, so they can produce heavy rainfall for long periods of time. Because the land stays warmer than the ocean for most of the summer and the ocean is a constant source of moisture, these heavy rains last for months at a time.

A monsoon climate is marked by dry winters and wet summers. About a quarter of the globe experiences a monsoon climate.



## Types of Monsoons in the world

There are several monsoon systems throughout the globe. Some of the most famous ones are:

- Indian summer monsoon – affects all of India. In the summer, the wind blows north from the Indian Ocean south of the Indian subcontinent and dumps heavy rain on the area from roughly April to October.
- Asian-Australian monsoon – affects southeastern Asia, the Australasian islands, and northern Australia. This monsoon happens from December to March because these areas are located slightly east of the opposite end of the Indian summer monsoon circulation. Since these areas are south of the equator, December through March is their summer, making this a summer monsoon, too.
- North American Monsoon – affects the southwestern United States. It is also a summer monsoon. This does not really have a seasonally reversing wind pattern, but heavy rain and storms occur more often from July to September over the desert. This monsoon is fueled by both the Gulf of Mexico and the Pacific Ocean.
- West African Monsoon – affects western Africa. It is fuelled by the Atlantic Ocean to its south and produces clusters of storms that can become Atlantic hurricanes from June to September.

Even if the weather is not directly affected by a monsoon, the climate is. Monsoons are large-scale air movements that can at the same time affect and be affected by global climate.

## Asian Monsoons

Here are two types of monsoons in Asia.

### Summer Monsoon



### Winter Monsoon

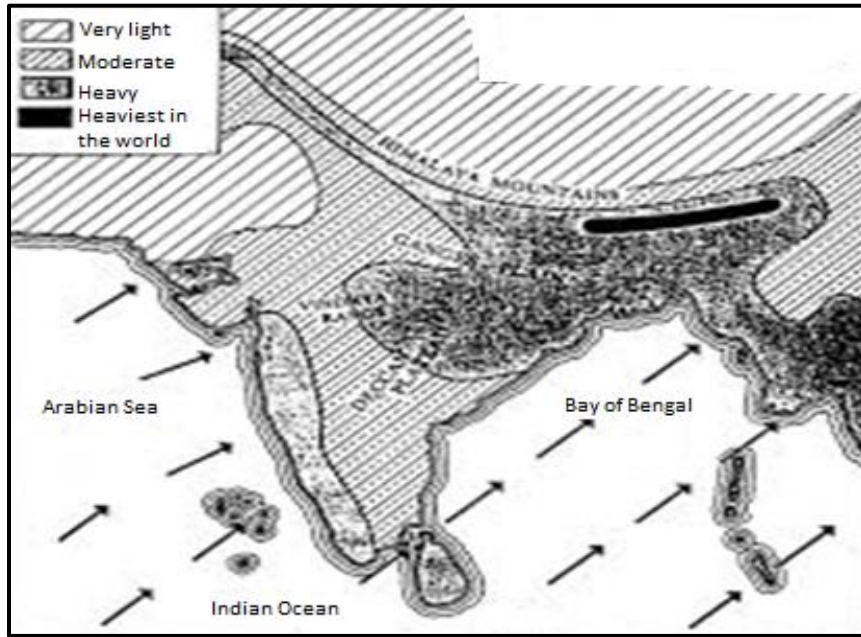


In the summer monsoon the winds blow from the Southwest, and in the winter monsoon, the winds blow from the Northeast.

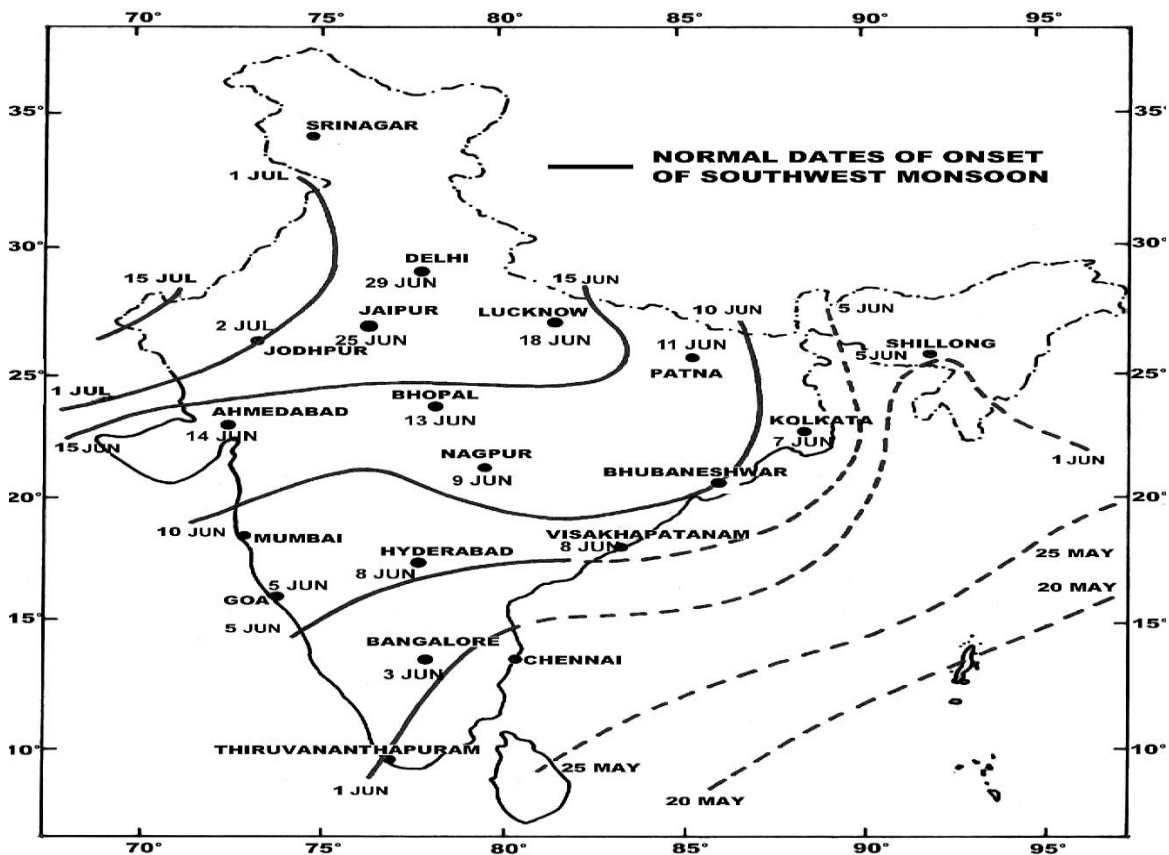
**Case Study 1**

In this case study you will read about the summer monsoon on the subcontinent of India. In this season the winds blow from the Southwest.

**India during the Summer Monsoon**



The Summer Monsoon is the Southwest Monsoon. You can see below the approximate dates of this monsoon in India.



*Example: An Indian town affected by the summer monsoon*

Cherrapunji, India, affected by the Indian summer monsoon, is one of the rainiest places on earth with an annual rainfall average of 34 feet. Back in 1861, Cherrapunji received over 87 feet of rainfall during the year with 30 feet of it falling in July alone. The southeast United States is not affected by monsoon rainfall, and only averages about 4 feet of rain per year, distributed fairly evenly across all seasons.



## Case Study 2

Monsoon rains cause misery for over 16 million South Asians.



The 2010 monsoon floods damaged farmland across the country, leaving farmers with no way of earning an income. The distribution of seeds, fertilisers, and cash grants to farmers to help them.



Illustration 10.2.6b: Houses flooded by the 2011 floods in the district of Badin in Sindh province, Pakistan





The 2010 monsoon floods damaged farmland across the country, leaving farmers with no way of earning an income. The distribution of seeds, fertiliser, and cash grants to farmers to help them.

Illustration 10.2.6c: A volunteer with the Pakistan Red Crescent Society helps a father, affected by the flooding in Badin district, Sindh province, Pakistan, carry a food parcel.

An overwhelming 16 million people were affected by flooding caused by heavy monsoon rains falling across South Asia. The floods caused massive movement of populations across Pakistan, India, Bangladesh and Nepal and it brought widespread destruction to homes, livelihoods and agricultural land.

According to the Pakistan government, five million people were directly affected by floods which struck areas across most of the country. During the last month continued rainfall caused flooding in 20 out of 23 regions in the Sindh alone, while areas of Eastern Provinces were also hit badly. Close to a million homes were destroyed and the disaster left thousands without food and shelter. Over 140,000 displaced people lived in temporary relief camps while the numbers rose.

In response to the worsening situation, an emergency appeal for 12 million US dollars to assist 105,000 people in five of the worst affected districts of Sindh. The appeal was going to fund the Pakistan Red Crescent Society relief operation which aimed to help families through the next four months with distributions of food rations and other relief items together with emergency health care and water and sanitation support.

### **Lucky escape by a family**

Floods and lost crops were not new to the Panhyar family who come from Khairpur in Sindh. Saifal Panhyar, a farmer, and his family were lucky to escape as their four-room house was destroyed when its walls collapsed when the floods engulfed his village. The village began to recover from the effects of last year's devastating floods before it was hit once again. Today, Khairpur is less than five feet of water and the floods have destroyed acres of cotton crops. The roads and streets are blocked and it is almost impossible to reach neighbouring villages.

Local people lack clean drinking water and Panhyar's wife and teenaged brother both got malaria due to the unhygienic conditions in the area.

Senator Nilofer Bhaktiar, chairwoman of the Pakistan Red Crescent said that for the past year they have struggled to help thousands to recover from the 2010 floods. Just as their crops were ready to be harvested, the floods have come again and destroyed all their crops.

### **More rain to come in India**

Heavy rains have overcrowded many States throughout India. Severe flooding has resulted in large-scale population displacement in the state of Assam as well as in Punjab and West Bengal. Entire communities remain stranded in some areas as flood waters have made it almost impossible for search and rescue teams to reach them.

Current government figures estimate that over 300 people have been killed and 8.6 million people have been affected across five States since the start of the monsoon season. The Indian Red Cross Society has launched a domestic appeal for 3.8 million US dollars and is aiming to assist 250,000 people (50, 000 families) across Assam, Bihar and Uttar Pradesh with emergency shelter, non-food relief and clean water.

The monsoon has also caused havoc downstream in Bangladesh where several major rivers have burst their banks. The floods engulfed vast areas of the country, causing misery for over 1.5 million people.

Nepal too has suffered this year. This year's monsoon rains triggered several flash floods affecting more than 2,600 families and claiming 90 lives, with 40 people reported missing. The Nepal Red Cross Society (NRCS) has responded in all the affected districts through its local level networks of volunteers and staff.

- **Impact of Monsoon in Papua New Guinea**

Now here below is an article about the impact of the Asian Monsoon in PNG. Read it.

Monsoon rains having serious impact on three PNG provinces. Monsoon rains have had a serious impact on three of Papua New Guinea's provinces, cutting off roads, destroying food supplies, and displacing people from flooded homes.

The director of the PNG National Disaster Centre, Martin Mose, says there are reports that hundreds of people in the Mt Hagen area in the Western Highland needing food and shelter after the Waghi River burst its banks. He says the Morobe region has also been affected by flooding in the Wau-Bulolo area, where a section of the main highway has been cut off.

And in the neighbouring Oro Province most villages are under water, crops damaged and fuel supplies are running dangerously low. Mr Mose says the Prime Minister Peter O'Neill is visiting the Oro region today to meet provincial administrators.

"We are here now to ensure that happens as soon as we have a meeting with the team here and once we sit with them then obviously we'll decide on that. But for most people who are already in need of food supplies, it will have to

be effective immediately."

Martin Mose says he is dispatching disaster officials to the Mt Hagen area today to assess the needs there.

Now read the summary.



### Summary

You have come to the end of Chapter 4. In this chapter, you have learnt that:

- monsoon is a prevailing wind in the region of South and South East Asia.
- during the winter monsoon, a large high pressure zone over Asia drives cool, dry air southward toward the tropics providing monsoon region with its dry season.
- during May and June the summer monsoon arrives with strong southerly wind flow driven by a warm air mass with low pressure that forms over southern Asia.
- a late arrival of the monsoon can be bad for agriculture, as the monsoon rains are necessary for summer crops.
- a weaker monsoon occurs over the dry southwestern United States in the late summer.
- monsoon season is a welcome relief to drought conditions in many areas of the world.
- monsoons can also bring about widespread famine and enough rain to kill hundreds of people in floods.
- the major tool behind a monsoon is a change in global wind patterns.

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**NOW DO ACTIVITY 6 ON THE NEXT PAGE**



4. What are two types of the Asian monsoon? Explain.

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5. As a result of this monsoon, there is a place in India that has the highest rainfall in millimetres all throughout the year. It rains almost every single day in this particular place. What is the name of this place?

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6. What direction does the winds in the summer monsoon blow in?

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7. Write one bad impact of a monsoon.

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**CHECK YOUR ANSWERS TO ACTIVITY 6 ON THE NEXT PAGE**



## Answers to Activity 6

1. Monsoon is a seasonal prevailing wind in the region of South and South East Asia, blowing from the south-west between May and September and bringing rain (the *wet monsoon*), or from the north-east between October and April (the *dry monsoon*)
2. During the summer, the land is warmer than the ocean. This causes air to rise over the land and air to blow in from the ocean. Rising air forms cloud and rain. These monsoon clouds are full of moisture from the ocean and can produce heavy rainfall for long periods of time. Because the land stays warmer than the ocean for most of the summer and the ocean is a constant source of moisture, these heavy rains last for months at a time.
3. There are several monsoon systems throughout the world. The most common one is the Asian Monsoon.
  - Indian summer monsoon – affects all of India. In the summer, the wind blows north from the Indian Ocean south of the Indian subcontinent and dumps heavy rain on the area from roughly April to October.
  - Asian-Australian monsoon – affects southeastern Asia, the Australasian islands, and northern Australia. This monsoon happens from December to March because these areas are located east of the opposite end of the Indian summer monsoon air movement. Since these areas are south of the equator, December through March is their summer, making this a summer monsoon, too.
  - North American Monsoon – affects the southwestern United States. It is also a summer monsoon. This does not really have a reversing wind pattern, but heavy rain and storms occur more frequently from July to September over the desert Southwest. This monsoon is fueled by both the Gulf of Mexico and the Pacific Ocean.
  - West African Monsoon – affects western Africa. It is fueled by the Atlantic Ocean to its south and produces clusters of storms that can become Atlantic hurricanes from June to September.
4. The summer and winter monsoon.
5. Cherrapunji
6. Southwest
7. A monsoon can bring about widespread famine and enough rain to kill hundreds of people in floods.

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**END OF PROJECT 2. NOW DO ASSIGNMENT 2 IN THE ASSIGNMENT BOOK**

## Glossary

<b>Abstinence</b>	self-restraint, self-control
<b>Accelerate</b>	speed something up
<b>Activist</b>	someone who is actively involved in a protest or a political or social cause, such as demonstrations, strikes, and sit-ins.
<b>Advocate</b>	a person who publicly supports or recommends a particular cause or policy.
<b>Agroforestry</b>	The deliberate use of woody perennials (trees, shrubs, palms, bamboo) on the same land unit as arable crops, fields or animals.
<b>Alter</b>	Change or modify something
<b>Artificial</b>	Man-made, not natural
<b>Brundtland Commission</b>	It officially disbanded in December 1987 after releasing the Brundtland Report, in October 1987, a document which it created, and defined the meaning of the term "Sustainable Development".
<b>Compromise</b>	a change that makes something worse and that is not done for a good reason
<b>Communicable disease</b>	an infectious disease that is passed on from person to person by direct contact with an affected individual or the individual's discharges or by indirect means, such a malaria (caused by mosquito).
<b>Co-operatives</b>	a farm, business, or other organisation which is owned and run jointly by its members, who share the profits or benefits.
<b>Cosmopolitan</b>	a person who has lived in and knows about many different parts of the world and cultures.
<b>critical</b>	expressing disapproving comments or judgements.
<b>CSIRO</b>	the Commonwealth Scientific and Industrial Research Organisation is the federal government agency for scientific research in Australia.
<b>deplete</b>	use up the supply or resources of.

<b>desalinate</b>	remove salt from (seawater).
<b>development</b>	an event starting a new stage in a changing situation.
<b>diminish</b>	make or become less
<b>dissemination</b>	spread (something, especially information) widely.
<b>epicentre</b>	the central point of something, typically a difficult or unpleasant situation.
<b>escalate</b>	increase rapidly or make or become more intense or serious.
<b>establish</b>	set up on a firm or permanent basis.
<b>estimate</b>	roughly calculate or judge the value, number, quantity, or extent of.
<b>Euro</b>	relating to Europe or the European Union.
<b>European Union (EU)</b>	The European Union is a politico-economic union of 28 member states that are located mainly in Europe. The EU operates through a system of international institutions and by the member states. It was founded in November 1, 1993.
<b>Formulate</b>	express (an idea) in a concise or systematic way.
<b>Global</b>	relating to the whole world; worldwide.
<b>Gusts</b>	a sudden strong rush of wind.
<b>Heterogeneous</b>	varied, mixed or diverse
<b>Implement</b>	put (a decision, plan, agreement, etc.) into effect.
<b>Indefinitely</b>	for an unlimited or unspecified period of time.
<b>Ingrained</b>	of a habit, belief, or attitude) firmly fixed or established; difficult to change.
<b>Intergovernment</b>	relating to or conducted between two or more governments.
<b>Legislation</b>	laws

<b>Live Aid</b>	was a dual-venue concert held on 13 July 1985, and an ongoing music-based fundraising initiative. The original event was organised by Bob Geldof and Midge Ure to raise funds for relief of the ongoing Ethiopian famine.
<b>Maternal Mortality</b>	Maternal Mortality is the death of a woman while pregnant or within 42 days of termination of pregnancy.
<b>Maternal Mortality Rate</b>	The maternal mortality ratio (MMR) is the ratio of the number of maternal deaths during a given time period per 100,000 live births during the same time-period
<b>Morbidity</b>	Illness. A person can have several co-morbidities at the same time. Morbidities are not deaths. Occurrence is a measure often used to decide the level of morbidity in a population.
<b>maternal mortality</b>	the death of a woman while pregnant or within 42 days of termination of pregnancy
<b>Maternal Mortality Rate (MMR)</b>	ratio of the number of maternal deaths during a given time period per 100,000 live births during the same time-period.
<b>Micro-fauna</b>	tiny animals living in the soil.
<b>Millennium</b>	period, time, era.
<b>Morbid</b>	of the nature of or showing disease.
<b>Morbidity</b>	is another term for illness.
<b>Norm</b>	something that is usual, typical, or standard.
<b>Objective</b>	goal, aim
<b>Potential</b>	likely, possible
<b>Prone</b>	likely to
<b>Propagate</b>	breed specimens of (a plant or animal) by natural processes from the parent stock.
<b>Qualitative Research</b>	method of inquiry used in many different academic disciplines, including in the social sciences and natural sciences.
<b>Rebate</b>	a partial refund to someone who has paid too much for tax, rent, or a utility.

<b>Recession</b>	a period of temporary economic decline during which trade and industrial activity are reduced, generally identified by a fall in GDP in two successive quarters.
<b>Sterilisation</b>	any process that removes or kills all forms of life and other biological agents (such as viruses).
<b>Supranational</b>	multinational, international
<b>Tailings</b>	the residue of something, especially ore.
<b>United Nations Development Programme (UNDP)</b>	the United Nations' global development network. Its Headquarters is in New York City; UNDP advocates for change and connects countries to knowledge, experience and resources to help people build a better life.
<b>United Nations Food and Agricultural Organisation (UNFAO)</b>	An international organisation that aims to achieve food security for all and to make sure people have regular access to enough food to lead active, healthy lives.

## References

United Nations (2013) *Global Sustainable Development Report-Executive Summary: Building The Common Future We Want*. New York: United Nations Department of Economic and Social Affairs, Division for Sustainable Development.

WHO (May 2016) *Country Cooperation Strategy at a glance*.

Retrieved on November 4, 2016, from

[http://apps.who.int/iris/bitstream/10665/136819/1/ccsbrief\\_png\\_en.pdf](http://apps.who.int/iris/bitstream/10665/136819/1/ccsbrief_png_en.pdf)

Retrieved from

<http://sustainabledevelopment.un.org/globalsreport/>

Retrieved from

[http://www.googleissues.org/issue/367/sustainable\\_development](http://www.googleissues.org/issue/367/sustainable_development)

Retrieved from

<http://onlinelibrary.wiley.com>

Retrieved from

[http://en.wikipedia/wiki/Population\\_Control#Methods](http://en.wikipedia/wiki/Population_Control#Methods)

Retrieved from

[http://www.indexmundi.com/papua\\_new\\_guinea/population\\_growth\\_rate.html](http://www.indexmundi.com/papua_new_guinea/population_growth_rate.html)

Retrieved from

[https://www.worldwatch.org/nine\\_population\\_strategies\\_stop\\_short\\_9\\_billion](https://www.worldwatch.org/nine_population_strategies_stop_short_9_billion)

Retrieved from

[https://sustainabledevelopment.un.org/sd\\_21.html](https://sustainabledevelopment.un.org/sd_21.html)

Retrieved from

<https://www.markswatson.com/popcontrol.htm>

Retrieved from

<http://globalsustainable.org/index.php>

Retrieved from

<https://wikipedia.org/wiki/Sustainability>

Retrieved from

<http://www.campfire-zimbabwe.org> target="resource window"><http://www.campfire-zimbabwe.org>)

Retrieved from

<http://www.globaleye.org.uk/archive/summer2k/focuson/index.html>

Retrieved from

[http://www.pg.undp.org/content/papua\\_new\\_guinea/en/home/presscenter/pressreleases/2015/03/13/call-to-men-to-be-a-part-of-the-solution/](http://www.pg.undp.org/content/papua_new_guinea/en/home/presscenter/pressreleases/2015/03/13/call-to-men-to-be-a-part-of-the-solution/)

Retrieved from

<https://www.unmilleniumproject.org/goals/gti.html>

Retrieved from

<https://www.geography.about.com/od/physicalgeography/a/monsoon.html>

Retrieved from

<https://www.unicefusa.org/mission>

Retrieved from

<http://www.charitynavigator.org/index.cfm?bay=content.view&cpid=1794>

Retrieved from

<https://reliefweb.int/organisation/ifrc>

Retrieved from

<https://www.greenleft.org.au/node/35135>

Retrieved from

Retrieved from

<http://www.campfire-zimbabwe.org>

Retrieved from

<http://www.who.int/countries/en/>

Global Health Observatory, April 2014; <http://apps.who.int/gho/data/node.cco>

Retrieved from

<http://www.ifrc.org/en/news-and-media/news-stories/asia-pacific/pakistan/monsoon-rains-cause-misery-for-over-16-million-south-asians-/#sthash.2m2JK9Wn.dpuf>

Retrieved from

<http://www.bom.gov.au/cyclone/about/intensity.shtml>

Retrieved from

<http://www.poverties.org/famine-in-africa.html#sthash.iv1rdKI1.dpuf>

Retrieved from

<http://www.our-africa.org/famine-and-agriculture>

Retrieved from

[https://en.wikipedia.org/wiki/Monsoon\\_of\\_South\\_Asia](https://en.wikipedia.org/wiki/Monsoon_of_South_Asia)

## FODE PROVINCIAL CENTRES CONTACTS

PC NO	FODE PROVINCIAL CENTRE	ADDRESS	PHONE/FAX	CUG PHONES	CONTACT PERSON		CUG PHONE
1	DARU	P. O. Box 68, Daru	6459033	72228146	The Coordinator	Senior Clerk	72229047
2	KEREMA	P. O. Box 86, Kerema	6481303	72228124	The Coordinator	Senior Clerk	72229049
3	CENTRAL	C/- FODE HQ	3419228	72228110	The Coordinator	Senior Clerk	72229050
4	ALOTAU	P. O. Box 822, Alotau	6411343 / 6419195	72228130	The Coordinator	Senior Clerk	72229051
5	POPONDETTA	P. O. Box 71, Popondetta	6297160 / 6297678	72228138	The Coordinator	Senior Clerk	72229052
6	MENDI	P. O. Box 237, Mendi	5491264 / 72895095	72228142	The Coordinator	Senior Clerk	72229053
7	GOROKA	P. O. Box 990, Goroka	5322085 / 5322321	72228116	The Coordinator	Senior Clerk	72229054
8	KUNDIAWA	P. O. Box 95, Kundiawa	5351612	72228144	The Coordinator	Senior Clerk	72229056
9	MT HAGEN	P. O. Box 418, Mt. Hagen	5421194 / 5423332	72228148	The Coordinator	Senior Clerk	72229057
10	VANIMO	P. O. Box 38, Vanimo	4571175 / 4571438	72228140	The Coordinator	Senior Clerk	72229060
11	WEWAK	P. O. Box 583, Wewak	4562231/ 4561114	72228122	The Coordinator	Senior Clerk	72229062
12	MADANG	P. O. Box 2071, Madang	4222418	72228126	The Coordinator	Senior Clerk	72229063
13	LAE	P. O. Box 4969, Lae	4725508 / 4721162	72228132	The Coordinator	Senior Clerk	72229064
14	KIMBE	P. O. Box 328, Kimbe	9835110	72228150	The Coordinator	Senior Clerk	72229065
15	RABAU	P. O. Box 83, Kokopo	9400314	72228118	The Coordinator	Senior Clerk	72229067
16	KAVIENG	P. O. Box 284, Kavieng	9842183	72228136	The Coordinator	Senior Clerk	72229069
17	BUKA	P. O. Box 154, Buka	9739838	72228108	The Coordinator	Senior Clerk	72229073
18	MANUS	P. O. Box 41, Lorengau	9709251	72228128	The Coordinator	Senior Clerk	72229080
19	NCD	C/- FODE HQ	3230299 Ext 26	72228134	The Coordinator	Senior Clerk	72229081
20	WABAG	P. O. Box 259, Wabag	5471114	72228120	The Coordinator	Senior Clerk	72229082
21	HELA	P. O. Box 63, Tari	73197115	72228141	The Coordinator	Senior Clerk	72229083
22	JIWAKA	c/- FODE Hagen		72228143	The Coordinator	Senior Clerk	72229085



### SUBJECT AND GRADE TO STUDY

GRADE LEVELS	SUBJECTS/COURSES
Grades 7 and 8	1. English
	2. Mathematics
	3. Personal Development
	4. Social Science
	5. Science
	6. Making a Living
Grades 9 and 10	1. English
	2. Mathematics
	3. Personal Development
	4. Science
	5. Social Science
	6. Business Studies
	7. Design and Technology- Computing
Grades 11 and 12	1. English – Applied English/Language & Literature
	2. Mathematics - Mathematics A / Mathematics B
	3. Science – Biology/Chemistry/Physics
	4. Social Science – History/Geography/Economics
	5. Personal Development
	6. Business Studies
	7. Information & Communication Technology

#### REMEMBER:

- For Grades 7 and 8, you are required to do all six (6) courses.
- For Grades 9 and 10, you must study English, Mathematics, Science, Personal Development, Social Science and Commerce. Design and Technology-Computing is optional.
- For Grades 11 and 12, you are required to complete seven (7) out of thirteen (13) courses to be certified.

### GRADES 11 & 12 COURSE PROGRAMMES

No	Science	Humanities	Business
1	Applied English	Language & Literature	Language & Literature/Applied English
2	Mathematics A/B	Mathematics A/B	Mathematics A/B
3	Personal Development	Personal Development	Personal Development
4	Biology	Biology/Physics/Chemistry	Biology/Physics/Chemistry
5	Chemistry/ Physics	Geography	Economics/Geography/History
6	Geography/History/Economics	History / Economics	Business Studies
7	ICT	ICT	ICT

**Notes:** You must seek advice from your Provincial Coordinator regarding the recommended courses in each stream. Options should be discussed carefully before choosing the stream when enrolling into Grade 11. FODE will certify for the successful completion of seven subjects in Grade 12.

CERTIFICATE IN MATRICULATION STUDIES		
No	Compulsory Courses	Optional Courses
1	English 1	<b>Science Stream:</b> Biology, Chemistry, Physics
2	English 2	<b>Social Science Stream:</b> Geography, Intro to Economics and Asia and the Modern World
3	Mathematics 1	
4	Mathematics 2	
5	History of Science & Technology	

#### REMEMBER:

You must successfully complete 8 courses: 5 compulsory and 3 optional.



















