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For Junior High School/ Islamic Senior High School

**Yoga Aribowo**

Grade

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## **Geography**

for Senior High School/Islamic Senior High School

Grade XI

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## Introduction

In the name of Allah the most merciful and graceful. Praise be to Allah SWT as without His blessing and grace the writer cannot complete this book. This book is based on the writer's experiences and thoughts since he has been being the lecturer up to present. The materials of this book are taken from various sources considering the Geography syllabus and the presentation of Geography textbook.

This book is arranged using the following systematization:

Chapter 1 Flora and Fauna  
Chapter 2 Population Dynamics  
Chapter 3 The Distribution of Natural Resources  
Chapter 4 The Environment

The writer tries to help you learning easily by preparing this Geography textbook. Moreover, the writer also tries to arrange it interestingly so you can easily learn and understand the materials. The materials are presented based on facts and occurring natural realities. Besides, to make it more comprehensible, the writers add some **pictures**, and enrichment materials in the form of **Supplementary Information, Active Self Exercise, and Pair Contribution**. To sharpen the analytical capacity and spatial thinking ability, the writer includes **Periodical Competency Test** and **Group Assignment** so you will be more active in solving spatial problems. At the end of each chapter, the writer also provides **Summary** to help you measuring your understanding of the material presented in each chapter.

Finally, the writer expects that this book will be useful for you in learning and understanding Geography. Then you are able to implement all in your daily activities.

Jakarta, June 2007

Writer

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## **How to Use this Book**

The beginning of each chapter consists of learning objective, key words, and concept map that will bring you to start the chapter

**The picture** contains visual explanation about the material to facilitate your understanding

**Active Self Exercise** includes questions to assess your ability in understanding the preceding material

**Mid Term Examination** consists of exercises to enable you measuring the material mastery of some chapters

**Summary** consists of the abstract of the material and key concepts that you have learnt.

**Chapter Evaluation** includes exercises to measure material mastery of a particular chapter.

**Pair contribution** contains questions to measure your ability and cooperation in understanding the preceding material

**Periodical Competency Test** contains series of activities done individually and in group to motivate you to be more active and dynamic

**Peer Assignment** consists of discussion activity that will test your ability in solving problems

## Chapter 1 Flora and Fauna

Objective:

After learning this chapter, the students will understand the importance of flora and fauna for life.

The environment on which we live together with other creatures is called biosphere. There are many kinds of organism and every region has different types of life. Flora and fauna in a region are related to the environmental condition. On the picture beside, we can see a seasonal flower called Four O' Clock or Marvel from Peru. This flower is unique as it is able to distinguish seasons by measuring the light and dark periods.

This is related to the environmental factors such as climate, soil, topography, and the living things. In addition to natural factors, flora and fauna are also determined by human beings.

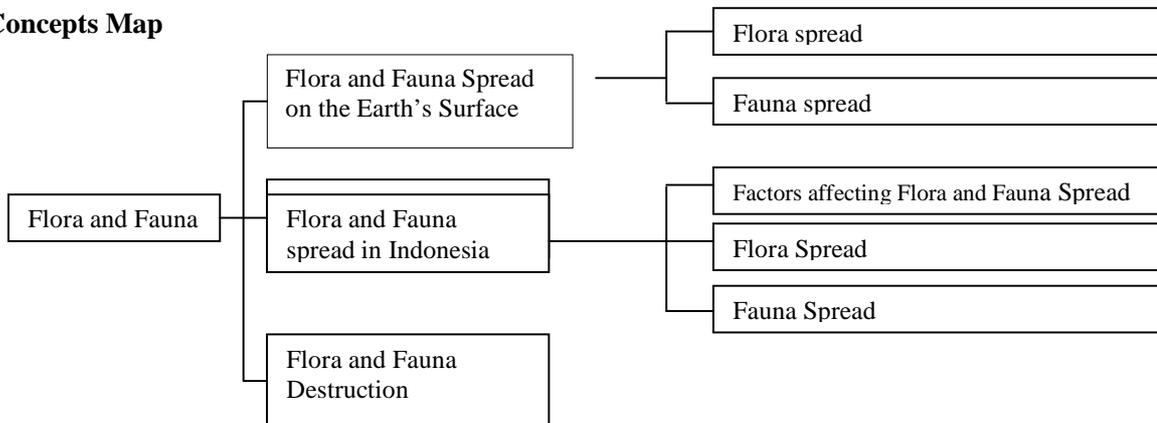
Source: [www.seenobjects.org](http://www.seenobjects.org)

Picture 1.1 Marvel from Peru in Lampung

### Key Words:

- Ecosystem
- Fauna
- Flora
- Habitat
- Population
- Community
- Forest
- Wallace
- Webber

### Concepts Map



## A. The Spread of Flora and Fauna on the Earth's Surface

Human beings greatly influence flora and fauna as both of them support human's viability. Flora and fauna are important components of ecosystem where interactions between the living things and the environment occur.

### 1. The Spread of Flora on the Earth's Surface

In this world there are living things called **organisms**. A Group of living organisms of the same kind is called **population**. A group of organisms that live together with another group, either similar or different types, is called **community**. A community consists of **biotic** and **abiotic**. They interact and affect each other and form an interrelationship called **ecosystem**.

All organisms live in particular place, including plants. A place where organisms live is called **habitat**. There are three main habitats, namely land, water and microhabitat. A habitat is considered natural if it includes biotic and abiotic elements.

An area which shows uniformity in habitat conditions is called a **biotope**. The biotope may exist because of the flora spread. A biotope is characterized by the similarity in regional factors such as medium, climate, and soil. These factors are as follow:

- a. climate, especially precipitation and air temperature;
- b. relief, determines types and the amount of vegetation in an area;
- c. soil, types of soil and the amount of nutrients influence types of vegetation;
- d. Human interference, such as industry, agriculture, and the development, influence the growth of vegetation.

Some biotopes which have similarity are grouped into **biochore**. For example, the sand desert biotope and stone desert biotope are grouped into desert biochore.

**Community** is a living partnership of plants and animals that live together in an area where they interact and adapt each other. The spread of community on the Earth's surface by Physiognomy is called a **biome** or a biota formation. The example of a climatic biome is tropical biomes.

#### a. Type of Tropical and Subtropical Biomes

Tropical and subtropical biomes consist of some types of rainforest, they areas follow:

## 1) Tropical Rainforest

Most of the tropical rainforest vegetations occur in the lowlands of equatorial zone, i.e., within the area bounded by latitudes 0°–10° North or South. Some of the areas are located around Amazon River in Southern America, along the equatorial zone of Middle Africa and West Africa up to East Africa and Malagasy. In Asia, they are in western India and Srilanka, Malayan region lying up to Himalayan Mountains. In the Eastern part, they cover a considerable part of Indonesia up to Fiji archipelago.

The tropical rainforest is characterized by heavy rainfall (wet) .i.e. between 2000-4000 mm per year, heavy fog, more than 80% humidity and 25°-26° C of annual average temperature.

The plants of tropical rainforest consist of some layers namely A, B, C and D. Layer A consists of some very high trees that spread out at the top or what is called **canopy**. One another grow far-off. The plants' height in layer B, the second layer, is 15-30 m tall, their crowns are connected each other forming a type of roof. Layer C consists of small but slim trees as they need to reach the sunlight. Their height is 5-15 m. Layer D consists of bushes and small trees which height is up to 2 m. There are also terna plants such as banana and ginger which height can be 5 m. Layer B occurs on the forest floor and it consists of mosses, epiphytes, and grasses.

Other plants that grow in the tropical rainforest are lianas (vines), epiphytes, strangler trees, parasites and saprophytes. Lianas (vines) are plants that twist and climb up other trees, the example is rattan.

Source: [www.weatherwhizkid.com](http://www.weatherwhizkid.com)

Picture 1.2 Levels of height layers in the tropical rainforest

source:  
www.members.virtual.tourist.com  
Picture 1.3 *Rafflesia Arnoldi* in Bogor National Park

Epiphytes are any plants that grow upon or attach themselves on trees' trunks, branches, and leaves. Epiphytes are classified into 3 characteristics below:

1. Extreme xerophytic epiphytes that live on the tip of branches and twigs, such as cacti.
2. Sun epiphytes, which are xeromorphic, mainly occur in the middle of the host crowns and along the branches.
3. Shade epiphytes, found on stalks and branches of layer C trees or on huge lianas, occur at shadier level, and consist of ferns, mosses, and algae.

**Strangler trees** are plants that firstly grow as epiphytes, but after grow up their roots reach the ground. Their branchy roots strangle the host plant until it dies, while the stranger trees will grow up. The example is banyan trees.

**Parasitic plants** are divided into holoparasites and hemiparasites. Holoparasites grow on lianas' root. They are leaf-less or branch-less; do not have chlorophyll; and their flowers grow from the host root. The example is *Rafflesia Arnoldi* in Sumatra tropical forest that produces the world's largest flowers at about one meter in diameter. Hemiparasites grow on another plant such as the epiphytes. The example is parasite plant, which absorbs the nutrient from the host root, although they are photosynthetic plants.

**Saprophytes** are colorless heterotopy plants that live in wet tropical forests. They obtain nutrients from dead organic matter. The examples are fungi or mushrooms and bacteria which help organic decomposition.

Source:  
[www.langsing.net](http://www.langsing.net)  
Picture 1.4 Tropical rainforest in Indonesia

## 2) Seasonal Tropical Forest

This forest occurs within the area bounded by latitudes 10°-23.5° North and South. This is a typical tropical forest which has a long dry season. The rainfall is between 1000- 2 000 mm per year. The duration of the dry season is 4-6 months or more. The vegetation is not so dense and some trees in these forests, like a teak tree, lose their leaves during the dry season. The seasonal forest occurs in India, Myanmar, Indonesia, Malaysia, North Australia, Middle America and South America.

### 3) Savanna and Brier

These forests consist of **xerophytic** vegetation dry conditions and often lose their leaves in dry. Moreover, they are open site forests; the trees are rather dwarf. Their heights are less than 20 m. There are a lot of geophytes (rooted plants), but only a few of lianas and epiphytes can grow. These forests are found in tropical and subtropical areas which have longer dry seasons such as East Africa, Middle Africa, Cuba, Brazil, India, China, also northern and eastern Australia.

### 4) Savanna with Tropical and Subtropical

The dominant plants in Savannas are high grasses. The rainfall is only 250-270 mm per year. Some are deciduous but some others are evergreen. In general they are xerophytic plants. The examples are acacias and palms. Savannas are spread in Orinoco which is a range of lianas, West Hindia, Middle Malagasy, India's range, western part of Middle America, middle Australia, and South Florida.

### 5) Mangrove

Mangrove can be found along the coast of tropical area. Mangrove usually occurs along the low and muddy coast. Moreover, tides occur in this area. Mangrove forests are spread in West Africa, Australia, and South East Asia, including Indonesia.

### b. Types of temperate climate Biomes

Temperate zones are located between tundra and subtropical area, i.e. 30-65 North Latitude and South Latitude. The seasons always change and so does the air temperature as well as the rainfall. In summer, the air temperature is higher than tropical area, while in winter it is as cold as the pole.

Biomes that occur in temperate area are dry broadleaf forest, coniferous forest, warm temperate rainforest, grassland and shrubland, dry Sclerophyll forest, and deserts vegetation.

Source : [www.upload.wikipedia.org](http://www.upload.wikipedia.org)  
Picture 1.5 Teak tree in Girisekar, Gunung Kidul is one of seasonal tropical forest vegetations which cascades in the dry season

Source : [www.lablank.or.id](http://www.lablank.or.id)  
Picture 1.6 Mangrove in East Borneo

that adapts to season. They grow apart tall. There are a little number of them spread in dry season, Argentina,

### Grasslands

with thickets. Some of the plants are acacias. However, in the mountain part of

### 1) Deciduous forests

These forests are located between 30-45 North Latitude and South Latitude. They have warm summer and less cold winter. The rainfall is 700-1700 mm per year. The trees have broad leaves which are evergreen in winter. They lose their leaves in summer. Their crowns are dense. The main plants are oak tree, basswood, and flowery herbs. The spread is mainly in eastern part of the United States, western part of Europe up to Ural mountain range, northern part of Japan and Asia continent. In South Latitude, the areas cover Patagonia, eastern Australia, and South Chile.

### 2) Coniferous forests

These forests are located in sub arctic climate area, such as northern Europe, Asia, and North America. They are also called taiga, boreal forest, cone-shaped forest or sub arctic forest. The forests are dominated by cone-shaped plants with straight stalks which grow up to 20 m tall. The plants are picea, pines, abies, hemlock, balsam and other conifers. These plants often accompany by broad leaves trees such as gray birch (*betula*) and populus.

### 3) Warm Temperate Rainforests

This forest is located in part of the USA near Caribbean sea, South Japan, New Zealand and Australia.

### 4) Grassland with shrub

In some parts of Asia, where climate is temperate and the rainfall level is low, this area is called **steppe**. In North America, it is called **prairie** which spread from Canada up to Mexico. Prairie is dominated by grass together with shrub and brier blossoming in different time. It is named after *pampa* in Argentine and South America, while in South Africa its name is veldt. The main animals are herbivores such as bison, antelope, deer, mule rabbit, hamster, gazelle, wild donkey, wild dog, fox, rattle snake, and prairie chicken.

Source:

[www.discoverve](http://www.discoverve)

[nezuela.net](http://nezuela.net)

Picture 1.7

Steppe in  
Kazakhstan

### 5) Dry Sclerophyllous forest

This forest exists in an area that is hot and dry in summer but warm and wet in winter. Typically, the leaves are evergreen, small, hard and thick, just like callus (Sclerophyll). The trees grow dwarf and low with

lumpy standing branches and has rounded or flatted crowns. The areas around Middle Sea and southern Black Sea are dominated by cor oaks (*Quercus suber*) and various types of pines, like allepo and stone pines. Meanwhile, community of chaparral bush occurs in western California and surroundings.

#### 6) Desert Vegetation

Deserts are regions which rainfall is poor. The are xerophytic thickets and grasses that can survive sufficient water. The dry climate forms the grey bushes which branches are low, thorny and puffy. examples of the plants are cacti, saguaro, Joshua sage, briers, and grasses.

Source:  
[www.freeze.com](http://www.freeze.com)

Picture 1.8

vegetations  
without  
dwarf  
The  
trees, small

#### c. Types of Polar Biome and Montane forest Biome

Polar climate consists of permanent ice, ordinarily fit the EF, and tundra, that meet the ET. Vegetation only exists in Tundra. Tundra is a land without tree and called the moss land. So, the typical tundra vegetations are mosses, nut grasses, cotton grasses, and hillock tundra. In the wet hollow live Salix grass and Gray Birches (bentula), like in Greenland. In the drier place, there are lichen, nut grass, ericaceous, and broad leaves plants. In the stone slope, moss, lichen, and algae grow.

Tundra= tundra  
Hutan hujan tropic = tropical rainforest  
Chaparral = chapparal  
Hutan hujan iklim sedang= temperate rainforest  
Padangrumput dan sabana= grassland and savanna  
Taiga= taiga  
Hutan meranggas iklim sedang= temperate deciduous forest  
Durun= desert  
Daerah pegunungan= montane forest  
Es= Ice

Source: wikipedia.org  
Picture 1.9 The Map of the World's Flora Spread

In the montane area, the temperature will be similar with tundra so the growing vegetation is lichen. The examples are in Mountain ranges of Andes in South America, Himalaya, Alpen, Rocky, Akonkagua, and Jaya Wijaya.

## **2. The Fauna Spread on the surface of the Earth**

Factors that determine the fauna spread are soil, relief, climate, water and biotic. The world's fauna spread can be grouped into 6 areas: Palearctic, Nearctic, Ethiopian, Oriental, Australian and Neotropical.

### **a. Palearctic**

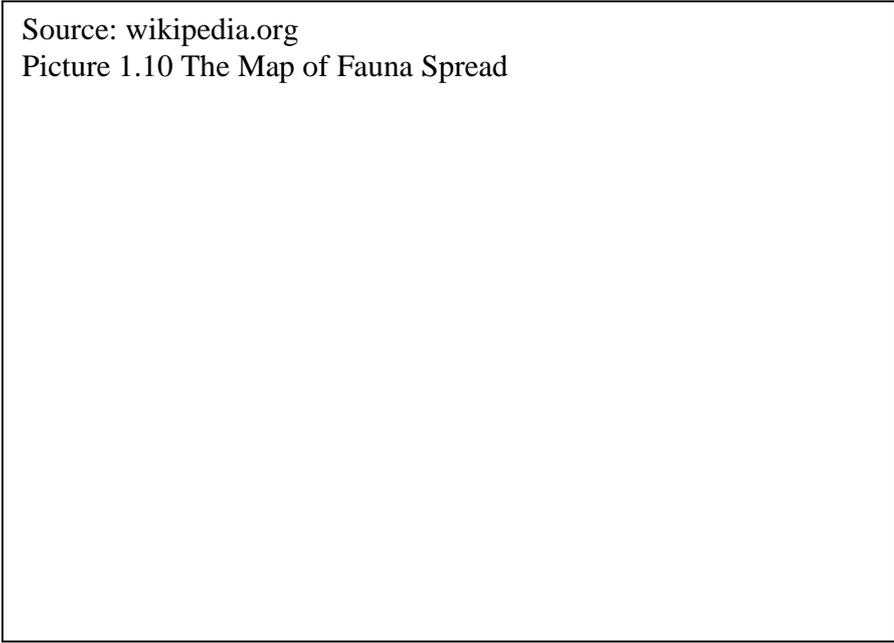
The spread covers northern part of Asia or Eurasia, Himalaya, Afghanistan, Persia, Africa, England, and Japan. Native fauna of these areas are rat, bull, polar cat. Animals which are limited are camel, polar deer, and polar bear. The endemic animal is Panda. This animal only lives in China. Unless being removed or proliferated, other countries do not have it. The reptile here relates to Africa's and Oriental's reptiles.

### **b. Nearctic**

This region covers holarctic area, i.e. all parts of North America, the highland in Mexico, and Greenland. The eastern part of North America has deciduous forest and Greenland has eternal snow. The typical fauna are turkey, mockingbird, salamander, caribauy, bison, and muskox.

Source: wikipedia.org

Picture 1.10 The Map of Fauna Spread



**c. Ethiopian**

The spread covers southern Africa, Sahara Desert, and southern Arabian. Ethiopian fauna have more than 161 vertebrates. The typical Ethiopian animals are giraffe, and African rhinoceros. Cat and dog, lemur, baboon, simpanse are animals that are identical with oriental type. special Madagascar fauna are small hippopotamus (pygmy hippopotamus) and some endemic birds such as big

Source:  
[www.simpatico.ca](http://www.simpatico.ca)  
Picture 1.11 Panda is endemic animal of China

Madagascar, land zebra, camel, gorilla, and Some type of elephant bird.

**d. Oriental**

The spread covers all South East Asia and South including western Indonesia. The typical fauna are tiger, gibbon, orangutan, one or two horns rhinoceros, deer, tapir.

Source:  
[www.homw.student.uu.se](http://www.homw.student.uu.se)  
Picture 1.12 Kangaroo as the special Australian animal

Asia, elephant, antelope, and

**e. Australian**

The spread comprise Australia, New Zealand, Moluccas, and the islands around Pacific Ocean. The Australian fauna are animals with pouches like anteater, some bird types like paradise bird, cassowary, and some reptile types like turtle and crocodile. The endemic fauna are kiwi and ancient amphibian (sphenodon) that only exist in New

New Guinea, typical kangaroo, and cockatoo, Zealand.

**f. Neotropical**

The spread starts from South America, Mexico, including Middle America. They belong to temperate climates. The special animals are anteater, hooves such as deer, pig, antelope, and horse. tapir are slightly different to Asian tapir especially

Source:  
[www.harunyahya.com](http://www.harunyahya.com)  
Picture 1.13 the camel in Sahara desert is able to store water.

southern tropical up to animals with Neotropical their back.

The biome-based fauna spread can be grouped as

follow:

**a. Desert Biome**

The rainfall level of this area is very low, precisely > 25 cm per year and it happens irregularly. During the day, the temperature is very high, but in the night it is very low. Desert fauna adapt to the dry environment, for example a camel retains water in its body. Some animals, like rat, lizard, and snake, hide in the night and go out if the weather is not so cold.

**b. Grassland / prairie Biome**

They occur in tropical up to temperate areas. The prairie's animal types are bison, antelope, przewalski horse, black tail prairie dog, wolf, wild dog, and fox. Some tropical desert fauna are squirrel, lemming, mole, bird, and insects.

**c. Tropical Rainforest Biome**

Animals in this biome are generally diurnal, or being active during the day like the birds in canopy area. Nocturnal animals, these are night active animals, live under the canopy and on the forest's floor. The examples are monkey, wild pig, wild cat, and squirrel. Based on the habit, the tropical rainforest animals are divided into two: arboreal and terrestrial. Arboreal is animals that live on trees, like monkey; while terrestrial is animals that live on the ground, like pig, bear, and panther.

**d. Taiga Biome**

Taiga is a cold area in north side of the earth and in the heights. The fauna have thick fur, such as lynk (snow cat), gray wolf, caribou and otter.

**e. Tundra Biome**

Tundra occurs in North Pole circle. The fauna here have thick fur, for example muskox, and have thick fatty tissue, like penguin.

**B. The Spread of Flora and Fauna in Indonesia**

Indonesia has a large amount of flora and fauna varieties. This is due to the geography of Indonesia, located between two continents. Indonesia has tropical rainforest that rich in tropical plants and animals.

As Indonesia is an archipelago, it is possible that some special plants and animals grow and extend in particular islands. Then, they adapt with the natural conditions then form the new species. It is also influenced by two biogeography areas, namely Oriental and Australian. The flora and fauna from these two regions meet here.

**1. Factors Influencing Flora and Fauna Spread in Indonesia**

The spread of flora and fauna in Indonesia is influenced by some factors, they are as follow:

**a. Soil**

The soil condition, particularly its fertility, its nutrient, and its type, influence the spread of flora and fauna.

**b. Relief**

Relief or the earth surface form will cause variety of altitude and temperature. Furthermore, these affect the flora and fauna varieties in Indonesia.

**c. Climate**

Climate determines the spread of flora and fauna. The climate elements such as light, rainfall, wind, and temperature affect flora and fauna growth.

**d. Water**

The state of water will influence the types of flora and fauna. In the dry area, xerophytes can grow. While in the wet area, hygrophytes, such as lotus and *eceng gondok* (*Eichornia crassipes*), can grow.

**e. Biotic**

Biotic or living things especially human beings influence the spread of flora and fauna. The biotic condition of an area may affect positively or negatively. It is positive if it supports the proliferation so they can grow and spread well. But, it is negative if it damages them or makes them extinct such as because of the hunt.

**f. Geological condition in the past**

Based on the geological history, Indonesia is divided into three sub regions, namely western part that belongs to Asian continent substratum, eastern part which belongs to Australian continent substratum, and the middle part which does not belong to both substratums. Indonesia islands that are included in Asian continent are Sumatra, Borneo, Java, and small islands surround them. New Guinea belongs to Australian continent, while Indonesia's islands that occur in the middle are Celebes, Moluccas and Nusa Tenggara.

During the ice age, namely Pleistocene period, the sea water froze at the earth's poles. Sumatra, Java and Borneo were part of Asia continent. Meanwhile, New Guinea and Arafuru Sea integrated with Australia.

When the Indonesia islands integrated, animals and plants migrated or spread freely from Java to Sumatra and Borneo or vice versa. Similarly, animals and plants could freely travel from Australia to New Guinea.

As the ice age over, the large amount of ice in the poles melted, so that the sea level increased significantly. Some lower lands were flooded, as the result, Java Sea, South China Sea, and Arafuru Sea were formed. As the animals and plants could not migrate anywhere else, they were then isolated in particular areas. Finally, they become the special plants or animals of particular Indonesia's islands. The flora and Fauna of western Indonesia are Asiatic as in the past they were part of Asia. The flora and fauna types of eastern part are Australian, while Celebes, Moluccas, Nusa Tenggara and Timor belong to typical middle Indonesia.

## **2. The spread of Flora in Indonesia**

Based on the geological history above, Indonesia's flora are divided into some areas namely flora of Sumatra-Borneo, Java-Bali, Wallace, and New Guinea. The plants are spread in these four areas that comprise tropical rainforest, seasonal forest, montane forest, tropical savanna and mangrove.

### **a. Sumatra-Borneo Flora**

He types of flora of this area are greatly influenced by Af climate. It is tropical rainforests with rich rainfall and high humidity. There are two types of flora that live in this region based on the causes:

- 1) Cosmopolitan vegetation, caused by high rainfall level. The most dominant area is dense tropical rainforest with specific species, such as timber trees, dipterocarpus trees and variety of orchids.
- 2) Ferns, lichens and fungi grow because of high humidity.

Vegetation which is not caused by the high level of rainfall and humidity is mangroves. They usually occur along the seashore and estuaries.

In Aceh, there is a famous park called Gunung Leuser National Park, which represents several ecosystem types of Sumatra starting from beach and swamp forest, lowland rainforest, up to montane forest. It is the most diverse park that functions as a natural laboratory to study germ plasma of tropical rainforest.

### **Active Self Exercise**

Mention the use of mangroves that grow along the seashore for the human life and environmental preservation. What are the main causes of the forest destruction and how are the effects?

In the swamp area of Gunung Leuser National Park, there are some commercial trees like camphor tree (*Dryobalanops Aromatica*) which produce camphor. This tree belongs to *dipteracarp*. Other types of *dipteracarp* are timber tree (*Shorea Sp*), keruing tree (*Dipteracarpus Sp*), and resin tree (*Hope Sp*). Other famous hard wood tree is tualang tree (*koompassia exelsa*). A plant that becomes the mascot of Aceh society is Champak (*Michelia champaca L*). Champak can be processed into champak oil for cosmetics. Other Sumatran floras are dipterocarpus tree, cinnamon tree, *Rafflesia Arnoldi*, orchid, Giant Corpse flower (*Amorfohophallus titanium*), jelutung tree and resin. The plants that are massively cultivated in North Sumatra are rubber, clove, coffee, pepper, tobacco, sugar cane, coconut, cinnamon, gambier, sugar palm, and kapok tree.

Borneo is famous for its tropical rainforests that rich in hard and big wooden trees. There grows rattan, a famous liana in Borneo. Moreover, South Borneo consists of lowland beaches, swamps, hilly areas and mountain ranges. In the middle, there is Merautus mountain range that lies from the north to the south and divides the area into two different regions. The eastern part is a hilly area dominated by prime forest, secondary forest, shrubs, and grassland. The western part is lowlands that consists of monotonous swamps, flood swamp, and tides swamp and alluvial. Mangroves, swamp forest, and area with various swamp grasses grow in these areas.

Some flora often becomes the regional mascot. Below are some flora that becomes the regional mascots in Sumatra and Borneo.

Regions	Flora Names
Aceh	Champak flower ( <i>Michelia champaca L</i> )
North Sumatra	Cananga flower ( <i>cananga odorate</i> )
West Sumatra	Andalas tree ( <i>Morus macroura</i> )
Bengkulu	Giant corpse flower ( <i>Amorphophallus titanium</i> )
Riau	<i>Nibung (Oncosperma tigillarum)</i>
Jambi	Red betelnut ( <i>Cyrtostachys renda</i> )
South Sumatra	Duku fruit ( <i>Lansium domesticum</i> )
Lampung	Ashar flower ( <i>Mirabilis jalapa</i> )
West Borneo	Tengkawang Tungkul/ Borneo Tallow Nut ( <i>Shorea stenoptera</i> )
Middle Borneo	Tenggaring ( <i>Nephelium lappaceum</i> )
East Borneo	Black orchid ( <i>Coelogyne pandurata</i> )
South Borneo	Casturi/ musk ( <i>Mangifera casturi</i> )

Source: National and provincial Flora Fauna mascots, 1993

### b. Java and Bali flora

Java- Bali landscape allows different climates occur in eastern and western Java. Western Java tends to have richer rainfall than eastern Java.

This phenomenon is caused by different climate pattern. Western Java's climate is Af or tropical rainforest. Further to the east, the climate turns into Am or tropical monsoon and Aw or tropical savanna. Because of these differences, diverse vegetations will grow.

- 1) Tropical Rainforest. This area has Af climate, it occurs around western Java having relatively high rainfall. Some of the areas are Ujung Kulon Sanctuary in Banten, Cibodas Sanctuary and Pananjung Pangandaran in West Java.

- 2) Tropical Monsoon/seasonal Forest. It is located around northern West Java up to Middle Java and some part of East Java. The climate is Am, that lacking in rainfall, so the typical vegetation is the trees that lose their leaves during the dry season, like teak wood. The areas exist in Alas Roban, Middle Java and teakwood forest around Jepara.
- 3) Tropical Savanna. It is a kind of grassland that is interspersed with some big trees. The climate is Aw, characterized by poor rainfall. The areas occur in eastern Java up to Bali, for example, Baluran sanctuary in east Java and West Bali National

Below are some flora that becomes the mascots of some regions in Java and Bali.

Region Name	Flora Name
DKI Jakarta	Condet Snake fruit ( <i>Salacca edulis</i> )
West Java	Marian plum ( <i>Bouea macrophylla</i> )
Middle Java	Kantil/white champaca ( <i>Michelia alba</i> )
DI Yogyakarta	Keppel apple ( <i>Stelechocarpus burahol</i> )
East Java	Sedap Malam/ tuberose ( <i>Polyanthes tuberosa</i> )
Bali	Majegau tree ( <i>Dysoxylum densiflorum</i> )

Source: National and Provincial Flora fauna Mascots 1993

c. Wallace Flora

Wallace area covers Celebes, Timor, Moluccas and Nusa Tenggara. The climate is dry and the temperature is higher than other Indonesian regions. As the result, the vegetations that grow here are as follow:

- 1) Montane forest in Celebes, such as the plants in Tangkoko sanctuary in the tips of Twin Mountains and Two Brothers in the northernmost part of Celebes.
- 2) Tropical Savanna in Nusa Tenggara, such as Komodo island sanctuary.
- 3) Mixed Forest in Moluccas with its famous plants such as canaries, sago palms, spices like nutmegs, cloves, cinnamons, and peppers.

**d. New Guinea Flora**

New Guinea is the easternmost island which climate is humid (Af) and the rainfall is similar to western Indonesia. The vegetation grows on tropical rainforest. New Guinean tropical rainforest is unique as it is always covered by fog that indicates high humidity. The endemic plant is *eucalyptus* similar with the one in Queensland, North Australia.

<b>Supplementary information</b>	
Below are some flora that become the mascots of eastern Indonesia	
<b>Region Name</b>	<b>Flora Name</b>
North Celebes	Langsei ( <i>Ficus minahase</i> )
Middle Celebes	Ebony wood
South Celebes	<i>Lontar</i> /wine palm
South East Celebes	<i>Anggrek serat</i>
West Nusa Tenggara	<i>Ajan Kelincung (Diospyros macropylla)</i>
East Nusa Tenggara	sandalwood
Moluccas	Orchid ( <i>Dendrobium phalaenopsis</i> )
New Guinea	<i>Matoa (Pometia pinnata)</i>

Source: national and provincial flora fauna mascots, 1993

**3. The spread of Fauna in Indonesia**

Indonesia has tree fauna areas, namely western Indonesia fauna, middle Indonesia fauna, and eastern Indonesia fauna.

**a. Western Indonesia Fauna region**

The area covers Sumatra island, Java island, Borneo island, and the islands surrounds. It is also called Sundaland fauna region. Wallace line is the border between western Indonesia Fauna and Middle Indonesia fauna. The fauna are as follow:

- 1) mammals that consist of elephant, one horn rhinoceros, tapir, *banteng* (Java's wild ox), buffalo, monkey, orangutan, tiger, rat, squirrel, deer, wolf, bat, porcupine, and wild pig.

Source <a href="http://www.ics.ucl.edu">www.ics.ucl.edu</a>	Source: <a href="http://www.members.topod.com">www.members.topod.com</a>	Source: <a href="http://www.ics.ucl.edu">www.ics.ucl.edu</a>
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Picture 1.14 an orangutan (left), a tapir (middle) and a one horn rhino (right)

- 2) reptiles that include crocodile, turtle, lizard, snake, gecko, monitor lizard (biawak), chameleon, scaly anteater.
- 3) birds that consist of owl, eagle, starling, peacock, finch/bulbul, and variety of birds.
- 4) variety of insects
- 5) variety of freshwater fish and porpoise or a kind of dolphin from Mahakam river.

#### **b. Middle Indonesia fauna Region**

This region is called Wallace archipelago fauna region. It spreads in Celebes Island and the small islands surrounds, Nusa Tenggara Island, Timor Island, and Moluccas archipelago. The fauna are as follow:

- 1) mammals that consist of dwarf buffalo, babirusa, cowfish, cuscus, black monkey, saba monkey, horse and *banteng* (java's wild ox).
- 2) reptiles such as monitor lizard, komodo, turtle, crocodile and snake.
- 3) amphibians, such as tree frog, flying frog, and water frog.
- 4) varieties of bird, such as *dewata* bird, *maleo*, waterfowl, king fisher, bee eater, *rangkong*, cockatoo, parrot, and pigeon.

Source: <a href="http://www.eaga.org.bn">www.eaga.org.bn</a>	Source: <a href="http://www.solvinzanki.org">www.solvinzanki.org</a>	Source: <a href="http://www.whozoo.org">www.whozoo.org</a>
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Picture 1.15 Paradise bird (left), dwarf buffalo (middle), and tangkasi (right)

### c. Fauna of Eastern Indonesia Region

This area is also called Tanah Sahul fauna region. It covers New Guinea and the islands surrounds. Webber line lies between eastern and middle Indonesia fauna regions. The types of the animals are as follow:

- 1) mammals, that includes kangaroo, wallaby, bear, Nordic or Iran's porcupine, possum or pouched climber, cuscus, tree kangaroo, and bat.
- 2) reptiles that comprise crocodiles, monitor lizard, snake and turtle.
- 3) amphibians, such as tree frog, flying frog and wild frog.
- 4) birds, such as parrot, kingfisher, paradise bird, cassowary, and namudur;
- 5) many kinds of fish.
- 6) many kind of insects.

Wallace line  
Webber line

Source: Indonesia and world's map, 2002 with some adjustment  
Picture 1.16 The fauna spread map in Indonesia

### Pair contribution

With your partner, answer the following questions :

1. Mention 15 typical Indonesia's fauna and the regions that use them as the mascots.
2. Mention some Indonesia's endemic fauna.
3. Mention some fauna that become the mascot of some regions.

### C. Flora and Fauna Destruction in Indonesia

The flora and fauna damage can be caused by natural factors, like fire, drought, volcano eruption, flood and landslide. The uncontrolled human activity that may destroy the environment needs more concern. Uncontrolled development may damage an ecosystem that further will affect on flora and fauna destruction.

Indonesia is a developing country that will continuously implement the developments optimally. In this era, people always want to use all kinds of resource but and have no concern on the preservation of flora and fauna. Without any control, there will be a serious destruction that is the genetic erosion.

Genetic erosion is the reduction of genetic diversity. It happens because of the extinction of particular flora and fauna types. It can be caused due to the decrease of habitat width, habitat damage, excessive exploitation, and injudicious use of technology.

As the human population in Indonesia increase, more settlement will expand. It will bit by bit reduce the size of animal and plant habitats. Animals and plants have specific size of "life space." For example, an elephant needs 250-500 hectare for its life space, while a tiger may explore up to 100 kilometers in a night.

The habitat damage may destroy even make particular flora and fauna extinct, eventhough the size remains the same. For instance, if a forest habitat is destroyed and it turns into a shrub, the ecosystem balance will be gone. Some types of pest animal may grow rapidly that in turn will cause other disasters.

Excessive exploitation will cause some animals and plants extinct. For instance, a massive wood and rattan exploitation will cause them extinct and so will the uncontrolled fish exploitation in the sea.

Many animals and plants may vanish due to the injudicious use of technology. For example, pollution resulted from industrial activities may cause some species extinct. The use of excessive insecticide and herbicide can make some species of fish, birds, insects and plants extinct.

Some species become extinct. Meanwhile, they are very useful for the human life. For example, types of animals and plants used as foods tend to decrease as the human civilization.

To maintain the genetic preservation of flora and fauna, some efforts need to be done, some of them are:

1. Establishing protected zones, such as sanctuary and conservation forest and animal sanctuary. Conservation forest has similar function as sanctuary, specifically to maintain hydrological function to protect genetic diversity.

2. Establishing buffer zones, it is a place to anticipate outer pressure toward sanctuary especially inhabitant's pressure in order to get the plantations, woods, and the other needs. Buffer is an area between agricultural terrain as well as settlement and the sanctuary.
3. Developing the protected zones, for example use the sanctuary for research, education and tourism.
4. Establishing national parks and zoo to collect some living things.
5. Establishing a genetic bank to store and maintain particular gen. This can be in the form of seed storage for plants, or sperm storage for animals. The development of biotechnology can improve particular types of flora and fauna.

### Summary

- The spread of flora on the earth's surface is divided into some types, namely, tropical and subtropical biomes, temperate biomes, polar biomes, and montane biomes.
- The spread of world's fauna is grouped into six spreading area, they are Palaearctic, Nearctic, Ethiopian, Oriental, Australian and Neotropical. Based on their biomes, the spread of world's fauna can also be classified into desert biomes, grassland biomes, tropical rainforest biomes, deciduous biomes, taiga and tundra.
- The spread of Indonesia's flora is divided into four, namely, flora of Sumatra-Borneo, flora of Java-Bali, Wallace Flora and Flora of New Guinea (New Guinea).
- The spread of the Indonesia's fauna is divided into three; they are fauna of western Indonesia, fauna of middle Indonesia and fauna of eastern Indonesia.
- The damage of flora and fauna will cause genetic erosion. It is the deduction of genetic diversity that happens due to the extinction of particular plants and animals.

### Chapter 1 Evaluation

1. Climate factors that influence the flora and fauna spread are...
  - a. The soil type, soil texture and soil fertility
  - b. the latitude and the landscape
  - c. the relief of the earth surface
  - d. temperature, humidity, wind and rainfall
  - e. human activities
2. Forest that occurs in a tropical area, has more than 2,000 mm per year average rainfall and has evergreen plants is called.....
  - a. seasonal forest
  - b. coniferous forest
  - c. tropical savanna forest
  - d. tropical rainforest
  - e. grassland
3. *Rafflesia arnoldi* that lives in tropical rainforest belongs to
  - a. tree strangler
  - b. herbs
  - c. epiphyte
  - d. saprophyte
  - e. parasite
  - a. edaphic
  - b. climatic
  - c. regional
  - d. landscape
  - e. aquatic
4. Tropical, subtropical, temperate, and polar are biomes which are grouped based on.....characteristic.
  - a. producer
  - b. consumer
  - c. decomposer
  - d. consumer and decomposer
5. In an ecosystem the plants' role is as...
  - a. producer
  - b. consumer
  - c. decomposer
  - d. consumer and decomposer

- e. producer and decomposer
- 6. The nature of temperate deciduous forest is...
  - a. The trees live apart, xerophytic, deciduous, poor in lianas and epiphytes.
  - b. not so dense vegetation, some trees lose their leaves in summer
  - c. not so dense vegetation, green in summer, some trees lose their leaves in winter
  - d. the high trees form a canopy
  - e. thorny plants
- 7. Holarctic regions, comprising North America, Mexico height, and Greenland include in.....region.
  - a. palearctic
  - b. nearctic
  - c. neotropical
  - d. oriental
  - e. Australian
- 8. Paradise bird is a bird that becomes the mascot of New Guinea. Its habitat is...
  - a. hinterland forest
  - b. swamp forest
  - c. high land forest
  - d. coastal lowland forest
  - e. upper course of Digul river
- 9. Wallace fauna is similar to fauna of...
  - a. western Indonesia
  - b. middle Indonesia
  - c. eastern Indonesia
  - d. Asiatic
  - e. Australiatic
- 10. The name of the animal in the picture below is.....
  - a. tapir
  - b. forest deer
  - c. dwarf buffalo
  - d. scaly anteater
  - e. kangaroo

Source:  
solvinzanki.org

**B. Answer the following questions correctly and write the answers in your work book.**

1. Mention factors that influence the spread of flora and fauna in Indonesia.
2. Mention the characteristics of tropical rainforest.
3. Mention the plants that form tropical rainforest.
4. Explain the characteristics of dessert flora and fauna.
5. What make the fauna of western Indonesia differ with eastern Indonesia?
6. Explain the characteristic of Wallace flora.
7. Mention the place where neotropical and oriental animals spread.
8. Mention five examples of western Indonesia's fauna.
9. What cause the destruction of Indonesia's flora and fauna?
10. Mention actions that should be done to preserve flora and fauna.

**C. Fill in the blanks below correctly and write the answers in your workbook.**

1. A unit that shows uniformity of habitat state and a place where living organisms live is called.....
2. The place where particular type of organism occurs is called....
3. Teakwood is a vegetation of.....forest.
4. The grassland in Argentine and the USA is named after.....
5. Tiger, elephant, gibbon, orangutan, one horn rhinoceros, deer, antelope, and tapir are native fauna of.....region.

**Periodical Competency Test**

Objective: Students understand the spread of flora and fauna in Indonesia

Answer the following questions and write your answer in a piece of blank paper.

- a. Which of flora and fauna division in Indonesia that best describe your region?
- b. Mention some plants that grow in your region.
- c. What are special plants that become the floral characteristics of your region?
- d. Make a map of flora spread in your place.
- e. Describe the cause of flora spread in your region (based on the map).

**Peer Assignment**

**The World's Main Deserts are Threatened by Global Warming**

Although dry and barren, deserts that cover almost one-quarter of the earth's land surface may become the source of future's energy and food. However, the huge open sites that become the environment of some useful and scarce animals and plants are threatened.

Deserts are the most potential place to build solar-power electric generator, the energy source that is environment-friendly and greenhouse gasses-free. There, plants that can survive in dry environment may turn into the global food sources, as water supplies become more and more scarce.

One of these is a plant called Nipa from Sonoran desert of western Mexico. It produces large wheat-sized grain yields. It survives in dry places even in the salty water.

"It is a strong candidate for a major global food crop and could become this desert's greatest gift to the world," says the report released by the United Nations Environment Program (UNEP).

**Water Exploitation**

Global warming triggers the climate change. Glaciers that become the source of water for people living around large rivers are declining as it melts faster. Meanwhile, far beneath water supply is drawn enormously too.

The Dashti Kbir desert in Iran has seen a 16 per cent fall per decade in rainfall during 1976 up to 2000.

During this same period, the Kalahari in South Africa has seen a 12 per cent decline while the Atacama desert in Chile has seen an 8 per cent drop. Water in Rio Grande river of the United States, is declining. Saudi Arabia exports water in the form of tomatoes.

If it left at that, the massive use of water will degrade underground water. The drop of water will probably lead to much more salinization of soils, and the soil's quality turns lower.

It is reported that in the Tarim River basin of China, more than 12,000 square km of land has been salinized over the last 30 years or so. Concerning the energy prices are rising sharply, desalination of sea water into drinking water, which is used in some middle east counties, is not economical as it consumes large amounts of energy.

### **Water War**

Besides threatening the environment, human life is also in danger. The civilization in world's deserted regions is threatened because of the rainfall drop and excessive water exploitation. The lack of clean water will trigger civil wars, struggling to obtain the remaining areas.

Adapted from "World's Main Deserts are Threatened by Global Warming."  
Source: Kompas cyber, 6 June 2006 with some adaptations.

1. Make a group of three.
2. Read the article above carefully.
3. Discuss it.
4. Answer the following questions correctly
  - a. What happens with the deserts?
  - b. Explain the causes.
  - c. What impacts that will be felt by the deserts ecosystems?
  - d. Mention some deserts' flora and fauna types.

## CHAPTER 2

### Population Dynamics

#### Learning Objective

After studying this chapter, the students should be able to comprehend the important of population dynamics and its use for daily life.

Anthroposphere is one object in geographical study that deals with human dynamics covering birth, death, and migration. In the picture beside, we can see some activities in a trade center. It shows that the human's mobility in this world is dynamic. This will bring the dynamics of population changes.

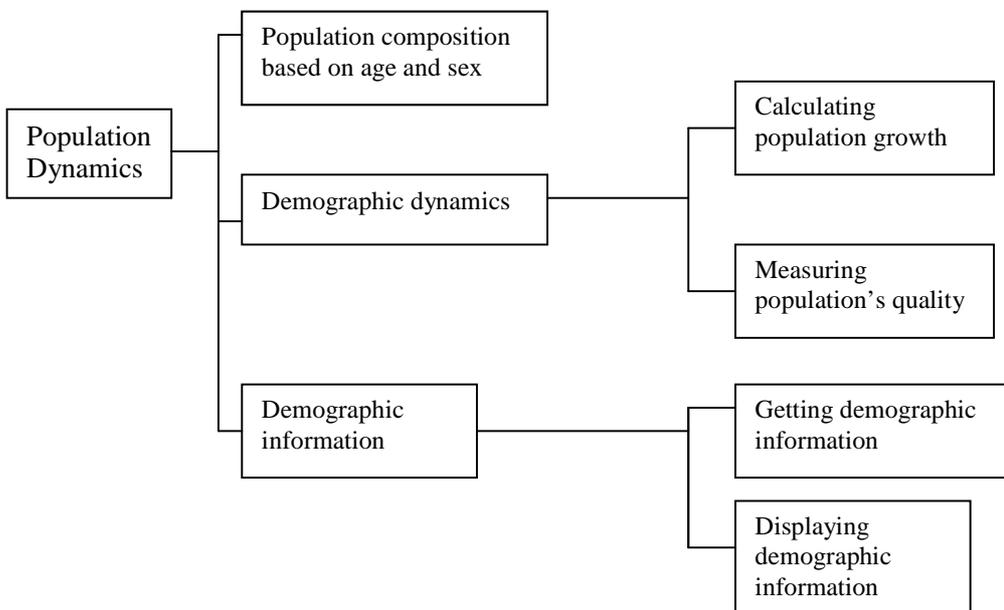
Source:  
upload.wikipedia.org  
Picture 2.1 People who visit  
Mangga Dua mall

This chapter will discuss the dynamics of population changes, specifically population composition and growth, and the display of demographic information.

#### Key Words

- Dependency ratio
- Population composition
- Population pyramid
- Population census
- Sex ratio
- Population survey

#### Concept Map



### A. Population Composition based on Age and sex

Population composition is the description of population situations in an area based on particular criteria. The example is compositions which are based on geographical, biological and social criteria. These criteria areas follow:

1. Biological population criteria, for instance based on age and sex.
2. Geographical population composition, for example based on social characteristics such as village dwellers and city dwellers.
3. social population composition, for example based on social identity, like marital status, education level, and occupation or income.

Population data, presented in a composition based on particular criteria, is a form of population data analysis that will be very useful for anyone that needs it. Population composition can show the population structure based on relatively homogeneous characteristics.

Among various compositions, the most frequent data are age-based and sex-based compositions.

Table 2.1 Indonesian population composition based on age and sex in 2000

Group and age (year)	Population number (person)		The amount of male and female population	Percentage (%)
	Male	Female		
Over 75				
<b>Total</b>				

Source: The statistics of Indonesia 2000, 2001

Why? Because age-sex based population composition is a prominent factor in demography. Almost all of demographic issues discussion always involves it. This kind of information is indeed important as it can predict the population number in the future, the number of available labor force. Moreover, the comparison between male and female populations based on age groups can be known. Based on age, population composition can be presented into single age, such as 0,1,3,4 etc. also use particular interval, 0-4,5-9,10-14, 15-19, 20-24 etc.

### Supplementary Information

Population density can be classified into two, they are:

1. physiological density, that is the comparisons of total number of population and the size of the agricultural land.
2. agrarian density, that is the ratio between the number of farmers and the size of the agricultural land.

A country is classified as having young age structure if the amount of less than 15 year old population is more than 35%. Developing countries such as Indonesia, India, Myanmar, Laos, and Vietnam usually have this structure. Indonesia's composition based on age and sex in 2000 can be seen in **Table 2.1**.

To facilitate the age grouping, age-based population composition is further classified into productive and non-productive. **Productive** age is a population aged 15 up to 64 years old, while **non-productive age** is a population aged 0-15 as well as 65 and over. If we use data of the above table, we can see the following things:

1. The percentage of productive age, that is 15-64 years old, is 65.03% or as many as 130,840,955.
2. The percentage of non-productive age, that is between 0-14 years old is 30.44% or as many as 61,250,199.
3. The percentage of non-productive age, that is over 65 year old is 4.53% or as many as 9,118,948. Hence, the total of non-productive age is as many as 70,369,147.

From the age-based population comparison above, the dependency ration can be counted. It can be calculated using the following formula:

$$\text{Dependency ratio (DR)} = \frac{\text{the number of non-productive age population}}{\text{the number of productive age population}} \times 100$$

### Example

Using the data above, find the dependency ratio by calculating the number of productive and non-productive populations.

Age

In millions

Source: Indonesian statistics, 2000, 2001  
 Picture 2.2 Population pyramid based on age and sex

**Answer**

$$\text{Dependency ratio (DR)} = \frac{70,369,147}{130,840,955} \times 100 = 53.78$$

Based on the calculation above, it is clear that every 100 of productive persons should responsible for 53.78 of non-productive people.

From table 2.1 we also know the following:

1. School age, that is the population aged 5-24 years old is 40.43% or as many as 81,355,441.
2. The data of age-based and sex based population composition can be analyzed further, for instance the population comparison based on age and sex. The sex-based comparison can be formulated using sex ratio. Sex ratio can be counted using the simple formula below:

$$\text{Sex Ratio (SR)} = \frac{\text{The number of male populations}}{\text{The number of female populations}} \times 100$$

Age

In million

Using the table 2.1 data, the sex ratio of Indonesian populations in 2000 is:

$$\text{Sex ratio} = \frac{100,909,016}{100,301,086} \times 100 = 100.61$$

By sex ratio = 100.61 means that in this area there are 100.61 males among 100 females.

The age-sex population structure can be described in a graph named age-sex pyramid. It starts by drawing two perpendicular lines. The vertical line shows the productive age group 0-4, 5-9 etc, while the horizontal line shows the size of population. The data in table 2.1 can be drawn into a pyramid as shown in the picture beside.

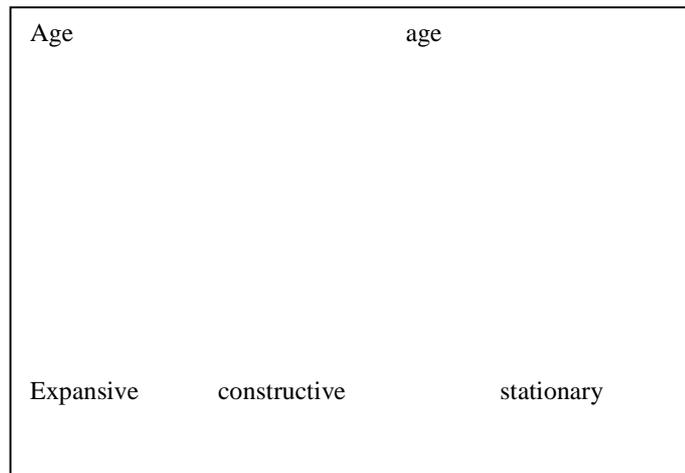
Picture 2.2 age-sex population pyramid

**Supplementary Information**

Based on year by year censuses, Java is the densest island, even in 2000 census; it reached 59% of total Indonesian population. Meanwhile, the size of this island is just 7% of Indonesian area. There are some reasons why Indonesian population is concentrated in Java. First is historical factor as since the era of ancient kingdoms and colonial almost all activities are centered in Java. Second, Java's soil is more fertile. Moreover Java provides many and various workplaces, has better social facilities, and becomes the government center as the Indonesia's capital, Jakarta, occur in this island.

Based on the shape, population pyramid can be grouped into three namely expansive, constructive and stationary.

1. **Expansive** happens if majority of the population occurs in young age group.
2. **Constructive** happens if the number of young age group is less.
3. **Stationary** happens if the population number in each group is relatively the same.



Source: wikipedia.org

Picture 2.3 Types of pyramid shapes

### **Pair Contribution**

1. Based on various type of age population pyramid, describe each shape based on the number of age group, natality level, and mortality level as well as the population growth.
2. Based on picture 2.3, how are the characteristics of Indonesian population in 2000 based on the amount of age group, natality level, mortality level, and its growth level?
3. Based on your analysis on activities 1 and 2, mention the population problems faced by Indonesia and write down the solutions.

## **B. Demographic Dynamics**

Demographic dynamics is continuous and interrelated events of population size changes. It deals a lot with the quality and quantity of population in a region.

The Quantity or size of population deals with the population's growth. The population growth of a region can be calculated based on the existing variables. The population quality influences the population's growth and vice versa.

### 1. Calculating Population's Growth

The population number of a country will change each year. In Indonesia generally it always increases. The changes of population size whether

decreasing or increasing is called **population growth**. Factors influencing the population growth are natality, mortality and migration.

- a. Natality is the level of birth which known from the birth rate. It is the number of live births per 1,000 of the population per year. It can be counted using the following formula:

$$\text{Birthrate} = \frac{\text{the number of live birth in a year} \times 1000}{\text{the population number}}$$

example

The population of Rajapolah subdistrict in 1997 is 23,500, and the live birth is 470. The birthrate in Rajapolah subdistrict is

$$= \frac{470}{23,500} \times 1000$$

$$= 20$$

- b. Mortality or death rate is the loss of the live signs of people permanently. It can be known from the death rate. It is the number of deaths per 1,000 of the population per year.

$$\text{The death rate} = \frac{\text{the number of death per year} \times 1000}{\text{Population number}}$$

Example

The population of Rajapolah subdistrict in 2001 is 25,000. The death number is 350. The death rate in this region is

$$= \frac{350}{25,000} \times 1000$$

$$= 14$$

So, of 1000 people in this region there were 14 people died.

- c. Migration is part of population mobility which means the removal of population for settling.

The population growth in an area basically can be classified into two; they are natural and social growths.

- a. **Natural population growth** is the development of population number that is obtained from the rasion between the numbers of birth and death. The formula is as follow:

$$T_a = B - D$$

T<sub>a</sub> = growth rate

B = birth rate

D = death rate

Example

The population of region A in 1990 is 4,000. There were 150 births and 80 deaths. How many are the percentage of population growth in this region?

$$\begin{aligned} \text{Answer: } T &= (150-80) \\ &= 70 \text{ persons} \end{aligned}$$

$$\text{The percentage of the growth is } \frac{70}{4,000} \times 100\% = 1.75$$

- b. **Social population growth** is the population growth that considers all demographical variables, i.e., natality, mortality and migration which is also called **total growth**. The formula is :

$$T_s = (B-D) - (I-O)$$

T = Social / total growth

B = birth or natality

D = death or mortality

I = immigration or inward migration

O = outmigration or outward migration

**Example**

The Population of Tembalang subdistrict is 8,000. From 1990 up to 1995, there were 450 births and 140 deaths. The immigrant numbers were 105 while the out migrants are 35.

Identified:

$$B = 450 \qquad I = 105$$

$$D = 140 \qquad O = 35$$

Question

How many is the social population growth in Tembalang?

$$\begin{aligned} \text{Answer: } T_s &= (450-140) - (105-35) \\ &= 310-70 \\ &= 240 \end{aligned}$$

Based on the calculation, it can be known that Tembalang population in 1995 is 8, 240 which gained from population number in 1990. So the population growth during 1990-1995 is

$$\frac{240}{8,000,000} \times 100\% = 4 \%$$

### Active Self Exercise

1. Region A's growth is 3 %. The number of birth rate is 72, while the death rate is 90. How many are the population of region A?
2. In 2003, there are 6, 350 people in region A. During 2003-2005, there have been 350 births and 120 deaths. 95 people come into this area for settling and 25 people move to other regions. How many is the population number in 2005 and what is the percentage of the population growth?

The population growth can also be counted using two formulas; they are geometrical and exponential growths.

- a. Geometrical population growth is the gradual growth.

Note:

$$P_t = P_o (1 + r)^T$$

$P_t$  = population number in year t

$P_o$  = population number in basic year

R = the population growth level (%)

T = duration in year

Example:

The population number of a city in 1993 is 1,956,250, while in 2003 is 2,223,130.

Count each year's population growth during 1993-2003.

Answer

$$\begin{aligned} P_t &= P_o (1 + r)^T \\ = 1,956,250 (1+r)^{10} \\ (1+r)^{10} &= \frac{2,223,130}{1,956,250} \\ 1+r)^{10} &= 1,136424 \\ &= 0.0055540 \text{ (antilog)} \\ (1+r) &= 1,012870 \\ r &= 0.012870 \text{ or } 1.29 \% \end{aligned}$$

So, the population growth of the city is 1.29% each year during 1993-2003.

- b. Exponential population growth is a direct and continues growth.

Note

$$T_s = P_o \cdot e^{rt}$$

e = exponential number i.e. 2,718,282.

If the question above is done using exponential formula, the calculation is as follow:

$$P_t = P_o \cdot e^{rt}$$

$$2,223,130 = 1,956,250 \times 2.718282^{10r}$$

$$2.718282^{10r} = \frac{2,223,130}{1,956,250}$$

$$= 1.136424$$

$$10r \times \log 2.718282 = \log 1.136424$$

$$10r \times 0.43295 = 0.055540$$

$$10r = \frac{0.055540}{0.43295}$$

$$10r = 0.127885$$

$$r = 0.01279$$

$$r = 1.28$$

So, the population growth of this city is 1.28 % each year during the period of 1993-2003. The difference of geometrical and exponential calculation results is 0.01%.

### Active Self Exercise

The population of region C in 1980 is 321,500 and in 2000 the number is 343,320. Count the population growth using geometrical and exponential formulas. Find the difference.

### Supplementary information

Migration is the population transport from a region to another. It can be distinguished into some types.

1. Transmigration, that is the movement of a large number of population from an island to another within a country. The people are called transmigrants.
2. Urbanization, that is the movement of population from countryside to live in a city. The people are called urban.
3. Immigration, the populations' movement from other countries into our country. The people are called immigrant.
4. Emigration, the population movement leaving a native country to settle in another. The people are called emigrant.
5. Circulation, that is shuttled movement of people, travel to cities in the morning and get back to the place of origin in the suburban in the early evening. The people are called circulars.
6. Community, that is the temporary movement of people from countryside to a city as in their native place the planting season is just going on, but as the harvest season arrives they will return. The people are called commuters.

## **2. Measuring Population's Quality**

Population Quality is the population state, whether individuals or groups, based on the advancement level that have been reached. It is an important component of every development's move because only highly qualified population that can speed up the nation's development. The big number population, without adequate quality, will just burden the development.

The standard of population quality is various and relative as each individual and their group have a variety of characteristics and background. Human performance is the combination of physical elements such as education and health, as well as non-physical elements such as faith, cooperation and empathy. The United Nation has given some measurable criteria of population quality in a certain place, i.e., from the level of education, health and economy.

### **a. Education**

The population quality in term of education is very important to be known as it describes the population's mastery of science and technology. The measurement of the educational level can be done by observing the population data concerning the members who are illiterate, elementary schools graduates, senior high school graduates, senior high school graduates and university graduates. From the point of view of education, the higher the percentages of illiterate people the lower the population quality of a particular country is.

### **b. Health**

Population health is an important factor that needs continuous improvement because it influences the productivity level. It means that from the point of view of health the more the unhealthy population the lower the population quality will be. The basic standard that becomes an indicator to measure the population quality based on health level is the infant mortality rate. It is the figure that indicates the number of death less than a year age infant from the total number of natality in a year per 1000 citizens. The higher the infant mortality rate the lower the quality of the citizen in a particular country.

### **Pair Contribution**

With your partner, find the data or information about Indonesia's population composition based on the educational level. Analyze the quality. Is the population quality high or still low? Mention some factors that cause that state.

Factors that influence the infant mortality rate in a country are as follow:

- 1) the nutrient status of the population's foods
- 2) the availability and quality of medicines, health facilities which common society, especially the low level economy group, can afford
- 3) income and education level of the population
- 4) sanitation of health environment

The infant mortality rate in the developed country is relatively low. It shows that the advancement of a country correlates with the health level. It also shows that the health level of a population relates to the advancement of other sectors.

### **C. Displaying Population Information**

Demographic data or information is a significant aspect of nation's development concerning that population is the subject and object of the development. Demographic data should be packed into informative and accurate information. Inaccurate data results in incorrect information and so it is likely that the policy taken based on this is also invalid.

#### **1. Getting Demographic Information**

The population number of a country can be known officially from the publication of census result. Population census is the process of collecting, managing and publicizing the demographical data in a particular country of the whole population in particular period. The activities of collecting, managing, and publicizing are inevitable prerequisites.

The census period is varying amongst countries. In our country, population census is done every ten years. In some other countries, especially in developed countries, it is done every five years. In doing so, there are two kinds of censuses, *de jure* and *de facto*. *De jure* census is a population census which is based on legal evidence possessed by the residence. One of the legal evidence is residence identification card. *De facto* census is the population registry which is conducted to every person met by the officers in a particular region, although the person encountered is not the residence of the region.

The objectives of the population census are as follow:

- a. To know the development of population number from a period to another.
- b. To know the spread and the density of population in every region.

- c. To know a range of social demographic information, such as natality rate, mortality, migration, and various factors that influence these three variables.

Demographic data in a country is very important for the basis in making development plan, they are as follow:

- a. To make a proportional distribution of population number appropriate with the carrying capacity of each region.
- b. To plan the establishment of social service centers, such as schools, hospitals, markets and shopping complex, residential facilities as well as transportation.
- c. To determine the future trends of population's development and growth using particular assumptions.

Institution that has authority to conduct census in Indonesia is BPS (Central Bureau of Statistics) existing in central, province and regency. The census has long since been conducted in Indonesia, even before Indonesia's independent, precisely in 1930 by the Dutch colonials. After independent, Indonesia conducted the first census in 1960, followed in 1971, 1980, 1990 and the last in 2000. The complete data can be seen in table 2.2 below.

**Table 2.2 Census data of Indonesia's Islands (million lives)**

Island	1961		1971		1980		1980		2000	
	Population	%	Population	%	Population	%	Population	%	population	%
Java and Madura	63.0	65.0	76.1	63.8	91.3	61.9	107.57	60.05	120.42	59.18
Sumatra	15.7	16.2	20.8	17.5	28.0	19.0	36.45	21.3	42.67	20.97
Borneo	4.1	4.2	5.2	4.4	5.7	4.5	9.10	5.06	10.95	5.38
Celebes	7.1	7.3	8.5	7.1	10.4	7.1	12.52	7.74	14.45	7.11
Other Islands	7.1	7.3	8.5	7.2	11.8	7.5	13.66	5.85	14.47	7.36
Indonesia	97.0	100	119.1	100	147.2	100	179.304.5	100	202.96	100

Source: statistics of Indonesia 2000, 20017.1

In the publication of Central Bureau of Statistics (BPS), the census result in 1990 shows that the population number of Indonesia is 179.3 million people. In 2000 the number increased to 202.9 million people. So, the number of Indonesian population is rise 23.6 million people in 10 years.

Besides using population census, the source of demographic data can also be gained from surveys and registry. Population survey is basically similar to population census, the difference are time, range of region, and census material. The survey time

**Supplementary information**

Institution that has authority to publicize census results is Central Bureau of Statistics. Besides it, other institutions that have similar authority are National Family Planning Coordinating Agency (BKKBN), Transmigration department and National Development Planning Board (BAPPENAS).

does not have to be periodical, but it can be conducted any time based on needs and finances. It does not have to be applied to all of Indonesian population, but only in specific area depends on types of data needed. The material is prepared thematically which means that it should fit the needs, for example, only fertility or perhaps only mortality and only migration.

Population's registry is the process of data collation concerning daily demographic events and other events that can change one's civil status. Population's registry is ideally done when someone is born or death, moves, gets married and divorces.

### **Active Self Exercise**

What do you think of demographic information system and population census in Indonesia?

## **2. Displaying Demographic Information**

Demographic data and information can be presented in the form of table, graph, and map. So, the appearance can be interesting and the accommodated information can be huge. Type of presented information not only accommodate one topic but also may topic.

### **a. Displaying Demographic Information using Table**

The information presentation in table forms is one common way. Majority of demographic data in Central Bureau of Statistics are presented in tables. This is the easiest way. Table 2.3 is an example of demographic data presentation through table.

### **b. Displaying Demographic Information using Graph**

The information presentation by graph can be grouped into three; they are pie chart, bar chart, and line chart.

- 1) **Pie chart** is a circle which is divided from its centre into several parts to show how the total amount is divided up based on the percentage. The steps in making a pie chart is as follow:
  - a. prepare the demographic data that will be presented in the chart, for example data in in table 2.3
  - b. change the data into percentage of the total data. Data of each province is divided by the total number of all provinces in Sumatra, then multiply by 100%.
  - c. Make a circle and its radius by comparing the percentage of the data and the angle of the circle. The full angle is 360 °.

Table 2.3 population data per province in Sumatra in 2004 and the area width

Province#	Population number (person)	Percentage of population number (%)
NAD	4,089	9.23
North Sumatra	12,123	27.35
West Sumatra	5,712	12.88
Riau	5,712	12.88
Jambi	2,625	5.92
South Sumatra And Babel	6,628	14.95
Bengkulu	1,549	3.49
Lampung	7,064	15.94
Total	44,325	100

Source: The statistics of Indonesia, 2004

The percentage of population number in Sumatra (%)			
15.94	12.88	14.95	14.95
10.23	5.92	3.49	27.35
West Sumatra			
Riau			
Nangroe Aceh Darusalam			
Bengkulu			
North Sumatra			
South Sumatra and Bangka Belitung			
Jambi			
Lampung			

Source 2.4 The statistics of Indonesia, 2004

Picture 2.4 Demographic Information in a pie chart

- 2) **Bar chart/graph** is a mathematical picture in which different amounts are represented by thin vertical or horizontal rectangles which have the same width but vary in height or length. The steps in making bar chart are as follow:
- Prepare demographic data, for example table 2.4
  - Make the horizontal axis (or x) and vertical axis (or y)
  - Name each axial line
  - Determine the interval value of the data considering the graph's size, then make the bar chart based on the data and the graph availability.

Table 2.4 The population number in 4 provinces at Borneo Island in 2004

Province	Population number (thousands)
West Borneo	4,033
East Borneo	1,870
Middle Borneo	3,227
South Borneo	2,766

Source: The statistics of Indonesia, 2004

The population number at Borneo Island in 2004		
Province	Population number (thousands)	
4,000,000	West Borneo	4033
3,000,000	East Borneo	1870
2,000,000	Middle Borneo	3227
1,000,000	South Borneo	2766

source: The statistics of Indonesia, 2004

Picture 2.5 Population number in each province in Borneo in a graph chart

- 3) **Line chart/graph** is a style of chart which data are pointed with a line or a spot, for example the development of population number year by year. The example is the population development from 1931 up to 2000.

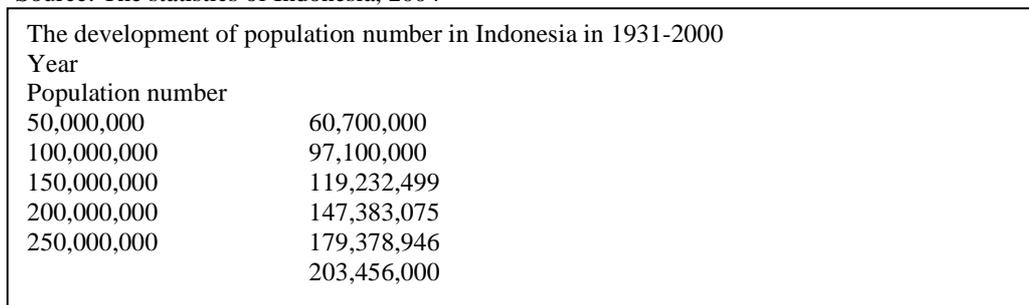
The steps of displaying a series of data using line chart is similar to bar chart that is by making vertical-Y and horizontal-X axes. But in the lines graph, the data values are plotted

and represented by spots. Then draw a line through these spots. The picture below is made based on the data in table 2.5

Table 2.5 Population census in 1931-2000

No.	Year	Population number
1	1931	60,700,000
2	1961	97,100,000
3	1971	119,232,499
4	1980	147,383,075
5	1990	179,378,946
6	2000	203,456,000

Source: The statistics of Indonesia, 2004



Source: The statistics of Indonesia, 2004

Picture 2.6 The display of population number development in a line chart

### c. Displaying demographic information by maps

As we have known that besides using tables and graphs, demographic information can also be gained from maps. A type of map that describes various demographic phenomena is called a thematic map.

Demographic phenomena described in the map are various; depend on the needs and other supported facilities. The example is the map of population distribution. The map of demographic data takes a very important role in setting up the development plan of a region. Displaying figures of demographic data through maps looks more interesting and communicative than tables. A map that comprises demographic data is called thematic demographic map.

There are various types of demographic data, but the most important data that can be mapped are population number, population composition based on age and sex, population density, population distribution, birth rates, mortality rates, mobility rates, and workforce rates.

I = represents 1 million people  
I= represents more than 500 thousand and less than 1 million people

Source : Publisher's documentation, 2007

Picture 2.7 Information map of population by pictorial symbol

Below is an example of population information display by a map.

Population map of South Sumatra province

Kabupaten= regency

Luas wilayah= area size

Jumlah penduduk= population

Catatan: untuk angka titik diganti dengan koma

Source : [www. bappedasumsel.go.id](http://www.bappedasumsel.go.id)

Picture 2.8 The map of population density in South Sumatra, 2004

## Summary

- Population composition is the description of population states in a region based on particular criterion. The criterion can be geographic, biological and social.
- Geographic population composition is based on location, such as population of countryside and city. Biological population composition is based on sex and age. Social population composition is based on social identity, marriage status, and education level.
- Demographic dynamics is events that continuously occur and inter related concerning the change of population number.
- Population growth is distinguished into natural and social.
- Demographic information can be displayed in the form of table, graph and map.

## Chapter 2 Evaluation

- A. Choose one of the correct answers and write your answer in your assignment book.
1. A region has the following characteristics: it has the birth rate that is lower than the mortality rate, majority of the population are adult, and it has negative young population number also negative population growth. The pyramid of this region is.....
    - a. expansive
    - b. stationary
    - c. constructive
    - d. expansive and stationary
    - e. all are correct
  2. The distribution of Indonesian population is uneven and most are in Java Island. It correlates with historical factor that is.....
    - a. the location of Indonesia capital is in Java
    - b. Java is separated into 6 provinces
    - c. In the past time, Java is the center of kingdoms
    - d. Java's soil is fertile
    - e. The development in Java is very rapid
  3. If in a census looks for the data of population's marital status, it is likely that the data will be used to know the population composition base don.....
    - a. geography
    - b. sex ratio
    - c. biology
    - d. social
    - e. physical
  4. Natural population growth is.....
    - a. The increase of population by adding the birth rate and death rate
    - b. The increase of population by finding the difference between birth rate and mortality rate
    - c. The increase of population by finding the difference between migration rate and mortality rate
    - d. The increase of population based on by adding birth rate and migration rate

- e. The increase of population by finding the difference of migration rate and death rate
5. Population census based on legal evidence such residence identification card (KTP) is.....
- de jure census
  - de facto census
  - population census
  - registry census
  - periodical census
6. Birth rate is.....
- number that shows the amount of birth in a year
  - number that shows the number of birth every year
  - number that shows the number of birth per 1,000 people
  - number which shows the amount of birth per 1,000 people in a year
  - number that shows the amount of birth per 100 people in a year
7.  $P_t = P_0 \cdot E^{rt}$  is the formula of....
- social population growth
  - natural population growth
  - geometrical population growth
  - exponential growth
  - demographic population growth
8. In 1995 the population of X is 10,000 people. During 1995 to 2000 there were 550 births and 150 deaths. There were 95 people who came for settling in this area and 55 people who move from this area and settle in other places. The population growth is.....
- 3.6 %
  - 4.6 %
  - 5.6%
  - 2.0%
  - 2.6%
9. In 2005 the population of Y is 20,000 people, while the birth rate is 330. The mortality rate in this area is.....
- 20
  - 18
  - 17.5
  - 60.3
  - 16.5
10. Dependency ratio basically reflects.....
- the number of productive age group citizens who responsible for non productive citizens
  - the number of nonproductive population that should be supported by the government
  - the percentage of nonproductive population divided by productive population
  - the number of babies and children who are supported by their parents
  - the percentage of nonproductive population supported by productive population

- B. Answer the questions below correctly and write your answer in your assignment book.
1. What is population spread?
  2. What do you know about antropospher?
  3. Mention factors that influence the population growth.
  4. What condition that can be described by expansive population growth?
  5. Explain the meaning of dependency ratio 80%.
  6. What are the meaning of *de jure* census and *de facto* census?
  7. Mention factors that influence social quality.
  8. Mention examples of social population composition.
  9. The population of M in 1985 is 500,000 people, and then in 2005 the number increased to 650,000 people. Calculate the population growth rate every year in 1985 to 2005 using geometrical and exponential formulas.
  10. It is identified that the population of Java island in each province in 2004 are as follow:

Province	Population (thousand)
Special Capital District of Jakarta	8,750
West Java	38,611
Middle Java	32,543
Special District of Yogyakarta.	3,223
East Java	36,482

Display the data presented in the table by pie chart and bar chart.

**C. Fill in the blanks with the correct answers and write your answer in your assignment book.**

1. The comparison between the number of male and female is called.....
2. The total population divided by the area size is called.....
3. The agrarian population density is.....
4. The population pyramid that generally exists in developing country is.....
5. The population health level can be seen from the rate.....

**Periodical Ability Test**

Objective: students can display demographic information using graph and map.

1. Display the data of population number below using pie chart, bar chart, line graph and map.
2. Each province's data is displayed by line graph.
3. Data per year are presented by bar chart which is condensed in the province's map.

Province	1980	1995	2000	2005
North Celebes	1,762,000	2,648,000	2,001,000	2,159,000
Middle Celebes	1,703,000	1,938,000	2,176,000	2,253,000
South Celebes	6,981,00	7,558,000	8,051,000	8,369,000
South East Celebes	1,349,000	1,587,000	1,820,000	1,923,000



## Mid Term Examination

A. Choose one best answer and write your answer in your assignment book.

1. Population of a country can be known from.....
  - a. interview
  - b. census
  - c. observation
  - d. questionnaire
  - e. question-answer
2. The change of population caused by birth, death, and migration is called.....
  - a. demographic transition
  - b. the increase of population
  - c. population dynamics
  - d. population composition change
  - e. population development
3. Indonesian population in 1985 is 164.05 million people while the growth level is 2.25%. The number of Indonesian population is doubled in.....
  - a. 2010
  - b. 2015
  - c. 2016
  - d. 2017
  - e. 2018
4. The population number per agricultural land width is called.....
  - a. agrarian population density
  - b. rough population density
  - c. physiologic population density
  - d. rational population density
  - e. agrarian environment support
5. The rate of Indonesian population growth is influenced by the rate of....
  - a. low mortality
  - b. high net migration
  - c. high natural growth
  - d. high fertility
  - e. high mortality
6. If an area has low sex ratio it can be predicted that there will be...
  - a. polyandry
  - b. mortality
  - c. polygamy
  - d. divorce
  - e. migration
7. Based on the early data in 1988, the total population of RW 3 of X village is 7,500 people, with 45% natality, and 25% mortality. There were 19 people came for settling into this place and 9 people moved into other places. The total population at the end of the year in this place is...
  - a. 8,992 people
  - b. 9,010 people
  - c. 8,007 people
  - d. 7,660 people
  - e. 8,660 people
8. it is predicted that fertility varieties amongst provinces in 1990 are caused by....
  - a. the age of the first marriage
  - b. cultural factor
  - c. education level
  - d. social factor
  - e. economic factor
9. A forest type which vegetation majority is in equator zone is....
  - a. tropical rainforest
  - b. seasonal tropical forest
  - c. shrubs
  - d. tropical savanna
  - e. temperate rainforest
10. Forest dominated by cone shaped trees reaching 20 meter tall is called....
  - a. Savanna
  - b. Mangrove
  - c. Coniferous forest
  - d. Tropical rainforest
  - e. steppe

11. Look at the graph below.

The population number in Sumatra in 2004
Population number
Province
West Sumatra
Jambi
Bengkulu

Source: The statistics of Indonesia, 2004

Based on the graph above, data of population number in Sumatra is presented in the form of:

- line graph
  - bar graph
  - circle graph
  - irregular graph
  - pie graph
12. Cananga flower is the mascot of...
- Aceh
  - North Sumatra
  - West Sumatra
  - Bengkulu

e. Riau

13. Tiger and elephant can be found in...

- Palaeartic
- Nearctic
- Ethiopian
- Oriental
- Australian

14. Scaly anteater can be found in...area.

- Neotropical
- Palaeartic
- oriental
- Ethiopian
- Nearctic

15. Eucalyptus can be found easily in...

- Papua
- Java
- Bali
- Sumatra
- Celebes

**B. Answer the questions below correctly and write your answer in your assignment book.**

- Why does a cone pyramid occur in a country?
- What is population quality?
- What is rough mortality rate?
- What is life expectancy rate?
- Explain population registry.
- Explain nonproductive group age.
- What are steppe and prairie?
- Explain why the water state influences the spread of flora and fauna in Indonesia.
- Considering flora and fauna damage in Indonesia, why should human activities be concerned?
- What is genetic erosion?

## Chapter 3

# The Spread of Natural Resources

### Learning objective

After studying this chapter, the students will understand the importance of natural resource spread and their benefits for life.

The land, sunlight, oil, coal and other minerals are natural resources that we use for living. In the picture beside can see a relatively huge Liquefied Natural Gas (LNG) plant in Bintuni gulf, Manokwari. The massive drillings have threatened thousands hectares of swamp forests in Berau gulf.

Can we imagine how if our natural resources damage run out? So, we must be wise in managing them, for the sake next generations. Hence, a wise way to manage the natural resource is needed that is environmental oriented with eco-efficiency principle.

Source: [www.elsam.or.id](http://www.elsam.or.id)

Picture 3.1 Giant Liquefied Natural Gas (LNG) plant in Bintuni gulf, Manokwari.

daily

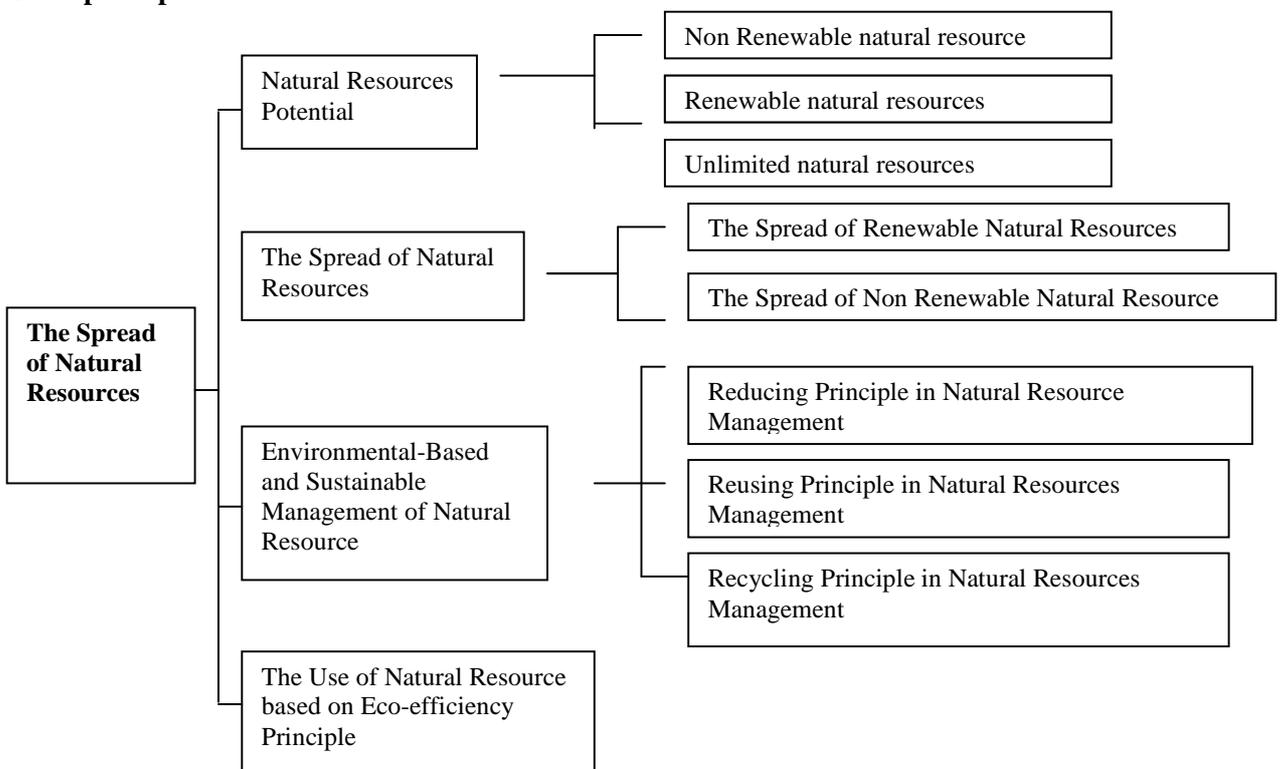
we

or  
of the

### Key Concepts

Flow Resources	Fishery	Agriculture	Stock resources
Forestry	Plantation	Animal husbandry	

### Concept Map



## A. Natural Resources Potential

Natural resource is any natural wealth which is potential and possible to facilitate humans' prosperity to satisfy humans' needs and viability. There are varieties of natural wealth, whether living things (biotic) or non-living things (abiotic) that can directly be used or things that need processing. The examples of non living thing that can directly be used are the sunlight, air, and clean water. The examples of non living things that require processing are cotton plant that will be turned into thread or fabric and husked-rice that will be proceed into rice.

Based on their characteristics, natural resources can be grouped into **physical natural resources**, such as land, water, and air, and **biotic natural resources** such as agriculture, plantation, forest and animal husbandry. The blend between physical and biotic natural resources is called **natural sphere resource**, for example the beauty of natural scene, mountain, valley, beach, and underwater panorama.

There are plenitude natural resources and there are also few or limited natural resources. In term of their spread, there are natural resources that occur in all regions but some only occur in particular regions, for example gold, coal and fossil fuel.

Based on the process, natural resources occur through two main processes. Some of them occur through natural processes that take million years, such as oil, coal, soil and gold. Some others are managed by humans, such as the product of plantation, agriculture, and animal husbandry that need relatively shorter time.

According to Isard (1972) in Soerianegara (1977), looking at the possibility of the restoration and the processing, natural resources can be grouped into three: renewable, non renewable and always available natural resources.

### 1. Non Renewable Natural Resources

Non renewable, fund, or stock resources are natural resources that cannot be replenished and generally cannot be "created" or engineered by humans in the formation process. They are abiotic natural resources or non living things. The examples are oil, coal, and other minerals beneath the earth.

### 2. Renewable Natural Resources

Renewable natural resources or flow resources are ones that can be replenished. They are natural resources that can be reproduced once they get depleted to generate new resources. The characteristic of these resources is the number can be improved and be increased.

They consist of all living things that can be cultivated, such as food crop, or vegetable resources and domesticated animals or animal resources.

### **3. Unlimited Natural Resources**

Natural resources that will never run out in the form of non living things that are always available, enormous in number, used by all living things, and usually important factors for the living organism's survival. Amongst natural resource types that are always available are the air and sunlight. The air is needed not only for breathing but also for generating wind-power electricity and for transferring radio wave for communication. The sunlight is also an energy source. It can be turned into electric power using sun cell in the center of solar power electric generator.

The parameter of natural resources is that they facilitate humans' prosperity so their existence depends on the level of humans' satisfaction. From this parameter, natural resources can be economical or non economical. The economical natural resources are ones that are valuable, can be commercialized and profitable. Economical natural resources can be grouped into highly economical, such as the mining of minerals and noble metals, and low economical resources such as the excavation of sand, stone, and limestone. Non economical natural resources are ones that need no cost in getting these, such as taking a breath, and getting the sunlight.

### **B. The Spread of Natural Resources**

The distribution of natural resources in the earth is uneven and not always plentiful in number. Some of them are limited in number. The spread, the number and the formation process of natural resources in Indonesia will be discussed below.

#### **1. The Spread of Renewable Natural Resources**

Renewable natural resources are basically ones that can be reused when humans can engineer or reproduce them.

They consist of various types. However, almost all of them deal with the layers of plants and animals lives plus other supporting natural factors, such as the sand, air and climate.

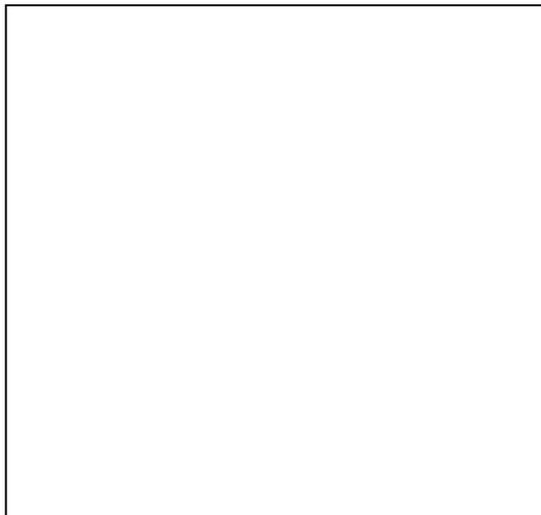
Some groups of renewable natural resources are agriculture, plantation, forestry, animal husbandry and fishery.

#### a. Agriculture

In Indonesia, agriculture/farming is the very basic work of the people. There are two agricultural forms in Indonesia, namely wetland and dryland farming. Wetland agricultural business can only be done in areas that are rich in water reserve and usually occurs in lowland areas. Dryland agricultural business is a type of farming that is conducted in the lacking of water reserve areas. It usually occurs in the hilly areas.

In general, dryland agriculture consists of irrigation rice field, tidal land, rainfed rice field, and valley rice field. **Irrigation rice field** gets regular watering from the irrigation so it does not depend on the rainwater. The harvest can be done three times a year. **Tidal rice field** usually occurs in lower course and shore side. It is planted during the low tide. *Banarawa* is a rice species that usually planted in this area. It can be found easily in Riau, around Barito lower course in Borneo, and around some lower courses of big rivers like in Palembang and Jambi. **Rainfed ricefield** is one which watering depends a lot on the rainwater. It is usually harvested once a year. **The valley rice field** occurs in the left and right sides of a river.

Dryland farming in Indonesia can be done by cultivating upland un-irrigated field (berladang), cultivating secondary crops in dry fields (bertegal), and gardening. **Upland agriculture (berladang)**



is processing the land by clearing forests or shrubs. The forest that has been turned into a rice field can only be planted for a few times. After its fertility reduced, it will be left and the farmers will look for another or clear another forest. The commonly planted rice type is *Gogo*. The business of this shifting farming is disadvantageous as it can destroy the forest ecosystem, accelerate erosion and accelerate the depletion of soil nutrient.

**Bertegal** is a farming activity in the dry land that depends a lot on the rainwater. The products are rice, cassava, sweet potato, corn, pulses, horticulture, or vegetables and fruits.

Source: [www.wikipedia.org.id](http://www.wikipedia.org.id)

Picture 3.2 An example of wetland farming business

in Boyolali.

## Supplementary Information

The system of Seven Exertion Farming that is worked by the government to improve farming consists of the following:

1. managing the land to maintain its sustainability
2. watering or irrigating
3. using the super seedlings
4. fertilizing to fertilize the land
5. eradicating of pest and disease, and
6. marketing of crops.

Farming products as natural resources of Indonesia are as follow:

1. Rice as the main food after turned into cooked rice.
2. Corn is the secondary food. It grows well at 0 up to 1,500 meters above the sea level and of 17 ° C up to 25 ° C temperature. Some of the corn producer regions are Madura, East Java, Yogyakarta, Lampung, Nusa Tenggara Barat, Nusa Tenggara Timur, South Sulawesi, and Gorontalo.
3. Sago is a plant from Ambon. It is the main food in Moluccas and Papua. It grows well in Moluccas, Papua, Riau, and West Borneo. It is also used as cake ingredient, while its leaves can be used as roof.
4. Cassava can grow almost in all parts of Indonesia. The producers are Lampung, West Java, Middle Java, Yogyakarta, East Java, Nusa Tenggara Barat and Nusa Tenggara Timur. Cassava can be processed into dried cassava (gaplek), tapioca and various foods.
5. Soybean is a plant that grows well in dry land like in *tegal*, *ladang* (upland), and house's yard. It is cultivated in Lampung, Middle Java, East Java, and Nusa Tenggara. It has many functions, for example it can be processed into tofu, tempe, soy sauce, frying oil, milk powder, and mixed fodder.
6. Nut is a pulses plant which is rich in vegetable protein. It is cultivated in dryland, upland and rice field during the dry season as the rice alteration. The producers are Java island and Celebes.

### b. Plantation

Looking at the exertion perspective, it is known that there are two types of plantation business in Indonesia, namely, civilian plantation and big plantation. Civilian plantation is worked excessively by the residents and usually run traditionally on the small-size land.

The products of civilian plantation are usually used to fulfill the needs of domestic population. Its characteristics are the size of the land is relatively small, it needs small capital and simple equipment, it is traditionally managed and it needs a little number of workers. Types of commonly cultivated plant are rubber, coffee, tea, tobacco, coconut, pepper, clove, nutmeg, areca nut, gambier, and cocoa.

Large plantation is a business conducted in a large land by private company or state-owned corporation. The characteristics are it has a well-arranged management, the land is very large, it needs a great deal of capital, it is worked mechanically and intensively, it has few number of worker, the product is prepared for export, and it has high productivity.

There are many types of potential plantation crops in Indonesia. Some of them can be seen in table below.

**Table 3.1 Some of plantation crops in Indonesia**

No	Plantation Crops	Producer regions
1.	Rubber	Sumatra (Kisaran, Deli, Jambi, Riau, Sputh Sumatra, and Lampung), Java (Wst Java, and east Java), Borneo (east Borneo, West Borneo, and South Borneo)
2.	Coffee	North Sumatra, South Sumatra, Lampung, Bali, and South Celebes
3.	Tea	West Sumatra, North Sumatra, South Sumatra, Middle Java, and East Java
4.	Tobacco	Deli Aceh, West Sumatra, South Sumatra, Surakarta, Yogyakarta, Besuki and Bojonegoro
5.	Glove	Moluccas, West Sumatra and Bengkulu
6.	Nutmeg	Moluccas islands, North Celebes, and West Sumatra
7.	Quinine	West Java, South Sumatra, and east Java
8.	Kapok	Middle Java
9.	Cinnamon	West Sumatra
10.	Sugar Cane	Java island

Source: The map of Indonesia and the World, 2002

### c. Forestry

Forestry is a unity of ecosystem in the form of lands containing natural biological resources dominated by trees within their environmental symbiosis. Forest is a renewable natural resource, eventhough it takes a long time. Forest's sustainability supports the sustainability of other natural resources, such as farming, plantation, and fishery.

Forest can be used to restrain flood, to form and accelerate the formation of soil nutrient, to arrange water management, to protect from the land erosion, and prevent landslide. Besides, it also has economic function and it is the producer of commercial commodities. The export of forest products is able to reduce dependency towards the oil and natural gas.

The width of Indonesia's forest is about 143,000,000 hectares which consist of protection forest (30,000,000 hectares), nature reserve forest and amenity forest (19,000,000 hectares), limited production forest and fixed production forest (64,000,000 hectares) and others (30,000,000 hectares).

Based on the location, forest is categorized into six types; they are tropical forest, monsoon forest, mangrove, swamp forest, coastal forest and peat forest. Based on function, forest is divided into conservation forest, protection forest, and production forest. The example of forest products are wood, rattan, bamboo and resin.

- 1) The woods resulted from the forest may be in the form of log, fire wood, charcoal material, and wood skin for tanning material. The major producers of log woods are East Borneo, West Borneo, Middle Borneo, Aceh and South Sumatra.
- 2) Rattan is a very long sucker plant which grows in dense tropical forest. It is actually secondary product because the main one is wood. It is greatly resulted in Sumatra and Borneo.
- 3) Bamboo as building material is also used as craft material and raw material for pulp industry. It is produced in East Java, the slope of Raung Mountain, southern Banyuwangi.
- 4) Resin is liquid gum taken from particular trees. They are various kinds of resin. Resin from the resin tree and copal are used as varnish mixture. Resin from champor tree and gum benzoin is used as perfume mixture. Not only used to fulfill domestic needs, resin is also exported.

#### **d. Animal Husbandry**

The activities of animal husbandry in Indonesia consist of the raising and propagation. In general, Animal husbandry can be grouped into three: large-sized animal husbandry, small-sized animal husbandry and poultry husbandry.

Source: [www.google.com](http://www.google.com)

Picture 3.4. Cow includes in large-size animal in Nusa Tenggara

- 1) Large-sized animal husbandry comprises cow, buffalo, and horse. The large animal husbandries occur in Nusa Tenggara and small islands surrounds. The animals are mostly grazed in grassland or savannah. In Java and Madura, they are bred in a stall or released in the farm yard. Horse husbandry is commonly found in East Nusa Tenggara, West Nusa Tenggara, and

South Celebes. Sandelwood from Sumba is famous for its well-built body. To improve the horse's quality, the government imports the offspring from Australia. The business of beef cattle in Indonesia has been developed in five provinces; they are West Java, Middle Java, East Java, Yogyakarta and Aceh. Efforts to improve cattle quality are done by artificial insemination, importing good quality cows, eradicating the diseases, opening grassland to feed the livestock, giving public counseling concerning efforts to increase the population of cow husbandry.

- 2) Small animal husbandry is the farming of small four-leg animals, such as goat, lamb, pig and rabbit. Goat and lamb are bred almost in all parts of Indonesia. Many people in Java islands, Madura, Bali, east Nusa Tenggara and South Celebes breed goat and lamb.
- 3) Poultry Husbandry is the farming of the winged, two-leg animals. The examples are chicken, duck, and swan and ras chicken. Usually, the poultry products are the flesh and the eggs.

#### e. Fishery

Fishery is an activity of utilizing the natural resources which is relatively open especially in the activities of catching, breeding, and processing. The areas for catching and breeding are the ocean, seashore, including brackish water and freshwaters fisheries.

- 1) Sea Fishery is the activity done in the sea water area. Types of fish yielded are anchovy, bonito, tuna, ray fish. The center of seawater fishery in Indonesia is in Bagan Siapi api-api which is the biggest fish port

Source: [www.usm.my](http://www.usm.my)

Picture 3.5 fisherman in West Java is trying to catch fish

in Indonesia, Cilacap of Middle Java Province, the center of tuna piscatorial/fishing zone and fish port in Muncar Banyuwangi of East Java province and of Middle Java.

2) Brackish water fishery is done in the ponds whether in the estuary or near the seashore. Types of fish yielded are mackerel, shrimp, and milkfish. This is run in north shore of Java, east shore of Aceh, Riau, North Sumatra, and South Sumatra.

3) Freshwaters fishery is run in the ponds and water in general like river, lake, or dam which is usually worked intensively using cage- system. Types of fish are gourami, goldfish, perch, and catfish. Freshwater fishery in the ponds and dams are done in West Java, like in Cirata dam, Saguling dam, and Jatiluhur dam, Toba Lake, Singkarak Lake of West Sumatra province, Poso Lake of Middle Celebes province, and Tempe Lake of South Celebes province.

Source:

[www.agribisnis.tripod.com](http://www.agribisnis.tripod.com)

Picture 3.6 Shrimp pond in Asahan conducted in the Seashore

occur  
Tegal

## 2. The Spread of Non Renewable Natural Resources

Non renewable natural resources are disposable and they are formed within a very long term. Based on the types, they are divided into energy and mineral resources. Minerals which are included in energy resource are oil, natural gas, geothermal, and coal. Mine materials involved in minerals are gold, silver, tin, nickel, bauxite, copper, and ferruginous sand.

Glove	
Cocoa	
Forest product	
Tuna fish	
Corn	rice
Kapok	nutmeg
Rubber	rattan
Coconut	seaweed
Palm tree	sago
Quinine	fiber
Coffee	tea
Pepper	tobacco
Diamond	shrimp
Cajuput oil	

Source : The map of Indonesia and the world, 2002

Picture 3.7 The map of biological natural resource distribution in Indonesia.

Source:

[www.tempointeractive.com](http://www.tempointeractive.com)

Picture 3.8 Offshore drilling

Source:

[www.creative.gettyimages.com](http://www.creative.gettyimages.com)

Picture 3.9 oil mill in  
Balikpapan

#### a. Oil

Oil is one of important fuels and energy sources because many of vehicle machines are constructed to use it. Handling the Oil is relatively easy comparing to other fuels. Oil mining is done using two ways, namely on shore and off shore.

Oil potential in Indonesia is spread in 60 basins of tertiary sediments which are divided into some sub basins namely west region and east region. East and west regions of tertiary sedimentary basins are separated by isobath line. It extends 200 meters long from north to south at the east of 115° 30' East Longitude, starting from the offshore of Borneo's East Shore down to the south passing Lombok strait. **Isobath** is line on the map connecting places of equal sea depths.

The tertiary sedimentary basin of west region is spread around Sumatra Island, Borneo and Java. The East region is spread in

Celebes, Nusa Tenggara and Papua.

#### Supplementary Information

Oil can be formed in a basin if the following requirements are available.

1. Alluvium (source rock) is the rock that comes from organisms' fossil especially foraminifera.
2. Reservoir is the oily rock which is completed by pores used as oil storage, for example sandstone and carbonate stone.
3. Cap rock or cover rock or lid rock, is impermeable rock so the oil can be trapped and cannot release from the reservoir.
4. Trap is a system which hinders the oil to release, for example the fold or the fault of the stratigraphic system.
5. Timeliness means if the oil has been formed after the requirements above are available so the oil will come into the system. If the oil is form earlier there will be no oil in the system as it releases or goes to another place.

Table 3.2 The distribution of Oil-producing regions in Indonesia

<b>Basin</b>	<b>Sub-Basin</b>	<b>Oil Producer Region</b>
<b>Sumatra</b>	<b>Northern Sumatra</b>	Lhok Sukon and Peureulak (NAD), Telaga Said, Tangai, Tanjung Miring Barat, Sukaraja, Mambang Sebas, Securai, Seruwai, Pakam, Rantau, and Siantar (North Sumatra).
	<b>Middle Sumatra</b>	Minas, Duri, Lirik, Rengat, Cenako, Ungus and Kuantan (Riau Land). Bunguran, Anambas, Tarempa, Udang, dan Laut Natuna (Riau islands).
	<b>Southern Sumatra</b>	Meraup, Betung, Bangko also the coast and offshore of Tanjung Jabung (Jambi Province); Talang Akar, Pendopo, Limau Tengah, Berau-berau, Suban Jerigi, Babat, Kukui, Mangun Jaya, Benakat, Bentayan, Beringin-kuang, Kayu Agung, Plaju-Sungai Gerong, northeast of Betara, Sungai Gelam offshore and Ramok-Senabing offshore (South Sumatra); Menggala and Lampung offshore in Java sea (Lampung).
	<b>Inter-mountana</b>	Mentawai and Omblin (West Sumatra)
<b>Borneo</b>	<b>Ketunggu and Melawai</b>	West Borneo and Middle Borneo
	<b>East Borneo</b>	Attaka, Serang, Melahin, Kerindingan, Sepinggian, Kutai, Samboja, Sangatta, Sanga-sanga, Nilam, Pulau Tarakan, Pulau Bunyu, Karang Besar, Tanjung, Delta Mahakam, and Balikpapan.
	<b>South Borneo</b>	Barito
<b>Java</b>	<b>West Java</b>	Java sea, i.e. Ngimbang, Sunda Basin, i.e. Mundu, Indramayu, Rangkas, Jatibarang, and Jatirangon.
	<b>Middle Java</b>	Cepu (Blora)
	<b>East Java</b>	Delta of Brantas river, Bawean, Madura offshore and Sampang
<b>Celebes</b>	<b>South Celebes</b>	Masalima, Popodi, Papalang, Donggal, Taritip, Jangeru and Tanjung Aru, Sabaru (South Sulawesi); Wowoni and Buton (South East Celebes). Nusa Tenggara and Moluccas East Nusa Tenggara Sawu sea
<b>Nusa Tenggara and Moluccas</b>	<b>East Nusa Tenggara</b>	Sawu sea
	<b>Moluccas</b>	Seram island, Bula, Banggai-Sula, Pulau Buru, North Seram island offshore, Barakan offshore in Arafuru sea, and Leti island offshore.
<b>Papua</b>	<b>Salawati</b>	Sorong, Babo, Klamono, Tamulaai, Sabaku, and Berau
	<b>Misool</b>	Femin, Sabuda and Samai
	<b>Bintuni</b>	Kaimana, Kilimala and Arguni

Source: The map of Indonesia and the World

The product off oil processing can be grouped into four, i.e. fuel, such as gasoline, diesel oil, kerosene, and avtur (airplane fuel), non-fuel, LPG and Petrochemicals. The non fuel product of oil processing is lubricants. Another product is LPG (Liquefied Petroleum Gas) that is associated gas existing in reservoir resulted together with the Oil. This gas is then liquefied and sold by the name of *elpiji*. LPG is used as the fuel for the gas stove.

The last product is petrochemicals. The products are bitumen or asphalt and wax. Asphalt is used for street hardening. Natural asphalt does not belong to bitumen, while wax is used to make candles for lighting and waxed paper.

## **b. Natural Gas**

Natural gas can be distinguished into two; they are associated gas and non associated gas. Associated gas is a natural gas which is found in a reservoir in association with oil. This gas which is yielded during the distilling process is named LPG (liquefied petroleum Gas). LPG is yielded from oil mills such as Arun of Aceh; Badak of East Borneo; Rantau of North Sumatra; Mundu; Arjuna; Balongan, of West Java; Cilacap of Middle Java; also Tanjung Santan and Balikpapan of East Borneo.

Non-Associated gas is natural gas produced from a reservoir that contains less significant quantities of oil. After the drilling process, this gas is stored and liquefied into LPG. The highly potential natural gas sources in Indonesia are Arun, Bontang and Natuna Sea.

Most of the Indonesia's natural gas products are exported and just small part of these supply domestic needs. The main export-destination countries are Japan, Taiwan, and South Korea.

## **c. Coal**

Coal is formed from the accumulation of dead plants deposited for million years. The coal formation comprises two main processes, biochemical and dynamochemical. Biochemical process is the process of peat mosses formation derives from the physical and chemical changes of plants' organic matters using anaerobe bacteria as well as control condition of reduction environment. Dynamochemical process is the turn of peat mosses into coal controlled by *diagenesis* after deposition such as by tectonic.

It is predicted that the coal potential in Indonesia is 36 million tones spreading in some regions; they are 4.70% in Nanggroe Aceh Darussalam, 11.40% in middle part of Sumatra comprising West Sumatra, Riau and Jambi, and 51.73% in southern Sumatra. In Borneo Island, 5.83% of them spread in West Borneo, 1.20% in Middle Borneo, 9.99% in South Borneo and 14.62% in East Borneo. The rest spread in Java Island, Celebes, and Papua. There are three types of mining, namely closed mining, open-pit mining and thin layers coal mining.

Coal is one of main energy sources other than oil and natural gas. As an energy source, coal can be used to support industry directly, such as for the fuel in cement industry

and steam power electric generator, for solid fuel or briquette, for limestone and roof-tile combustions, for metallurgical reduction or the processing of metal ore into useful metal, as coke or charcoal residue. Coal is also non smoky fuel.

#### **d. Geothermal energy**

Geothermal is also an important energy source. It is predicted that the potential of Indonesian geothermal is about 8,000-10,000 mega watt (MW). 5,500 MW occurs in Java Island and Bali, 1,100 MW is in Sumatra Island and 1,400 MW in Celebes Island. The rest spreads in Nusa Tenggara and Papua. Geothermal source is associated with volcanoes.

The first geothermal energy in Indonesia was resulted from Kamojang of West Java. In 1988, a geothermal station sized 140MW was built in this place. To complete the existing station, two more geothermal stations were set, so since late 2000 the power of Kamojang geothermal source becomes 250 MW. Some other geothermal sources are in Dieng of Middle Java; Lahendong of North Celebes; Salak Mountain and Drajat Mountain of West Java; Sarulla of West Sumatra; Sibayak of North Sumatra.

#### **Supplementary Information**

Geothermal system actually can be categorized as renewable natural resource if the hot water source is still active. It is because water, as the steam former, other than from meteoric water gained from absorbed rain water, can also be gained from water injected through filling up well so the steam can be formed.

To keep the sustainability of geothermal energy, the rain capturer area (reachard) must be maintained. Do not ever let the area turn into a bareland so the water, as the steam source, cannot go through the geothermal system.

#### **e. Minerals resources**

Minerals are non renewable natural resources. There are two types of minerals: metallic and non metallic. Minerals that produce metal are gold, silver, and platinum as noble metals. Copper, lead, zinc, and tin or basic metal such as iron, nickel, or iron metal. Industrial minerals are phosphate, asbestos, sulfur, limestone, ocher, clay, manganese and gypsum.

The mineral categorization conducted by the Indonesian government is based on laws number 11 in 1967 about the primary rule of mining known as the primary law of mining. Act 2 of the law mentions that mining materials are chemical elements, minerals,

ores, and any kinds of stone, including natural precious stone deposits. Furthermore, Governmental Rule number 27 in 1980 about the Categorization of Minerals mentions that minerals are divided into three; they are strategic minerals, vital minerals, and other minerals.

Strategic minerals are also known as group A minerals. The types are oil, natural gas, uranium, coal, nickel, and tin. Vital minerals are also known as group B minerals. The types are iron, manganese, bauxite, copper, lead, zinc, gold, platinum, silver, diamond, iodine, and sulfur. Other minerals or group C are phosphate, asbestos, mica, alum, ocher, jewel, quartz sandstone, kaolin, feldspar, gypsum, pumice, marble, schist, limestone, granite, clay and sand.

Below are some important minerals which have been developed, they are tin, nickel, bauxite, gold, silver, copper and diamond.

### **1) Tin**

Base on the formation, tin is distinguished into primary and secondary tins. Primary tin deals with the intrusion of granite stone which contains stannite and cassiterite and cassiterite quartz. Secondary tin is resulted from the decay and the erosion of granite stone which contains tin ores. The decay is washed out to other places usually to the seashore so the deposit of secondary tin forms placer deposit. So that, in general the deposit of alluvial and alluvial tins, known as skin and kaksa deposits, is formed. Two third of world's tin is from alluvial deposit. Twenty percent of the world's tin spreads in Indonesia. The rest are in Malaysia, Congo, Nigeria, East Africa, and Middle Africa.

In Indonesia, tin can be found in Bangka island of Bangka-Belitung province, Riau, precisely in Lingga, Singkep, Karimun, Kundur and Bengkinang, and South Celebes. The product of tin mining exploitation is tin ore which further is processed into ingot tin or metallic tin in the foundry. The center of Indonesia's foundry is in Muntok, Bangka island.

### **2) Nickel**

Nickel is a strategic mineral that belongs to group A. It occurs in the basic and ultra basic tones like in pyroxenite and dunite which characteristics are having high specific gravity, having dark or greenish dark color, and rich in iron and magnesium.

In Indonesia Nickel is firstly found in Pomala, South East Celebes in 1909. Others are in Soroako, South Celebes, processed by INCO, Inc., Ltd. , and then in Gebe island, Pakal island, Tanjung Buli and Obi island of Moluccas and Gag island as well as Cyclops mountain range in

Papua processed by Aneka Tambang Inc., Ltd. The main export destination country of Indonesian Nickel is Japan.

### 3) Bauxite

Bauxite belongs to aluminum hydroxide mineral so after being processed it results in aluminum. Bauxite colors white or yellowish in its pure state, red or brown if it is mixed or contaminated by iron oxide or bitumen. Bauxite is relatively soft, having 1-3 hardness, soluble (able to dissolve in water), breakable, and non flammable. This mineral is formed from the decay or laterization of alluvial stones which is closely related to the granite spread.

Bauxite mining was firstly established in Bintan Island in 1924 and exported for the first time in 1935. The business is done by Antam, Inc., Ltd. The center of bauxite processing is in Kijang of Bintan Island, Riau which cover 8,002.4 hectares. It is predicted that bauxite reserved in Bintan island is 964,900 metric tones. Antam Inc. Ltd. predicts that the new area Wacopek, Bintan has 2,773,600 metric tones of bauxite reserve. In 1997 bauxite is started to be produced in two areas; Pari Island and Galang island as much as 808,749 metric tones. It is predicted that there are 850,000 metric tones of bauxite product in 1998.

### 4) Gold and Silver

Gold and silver are noble metal. In nature, both often occur concurrently and associate with copper, iron, zinc, and platinum. Gold is the most easily recognized: it is yellow, soft, malleable, acid proof, and not easily oxidized.

Primary gold ore occur in stones that have changed or faced alteration in a hot metal-carrier solvent or hydrothermal which forms quartz vein. If these stones are decayed and washed out by erosion the gold can be transported and deposited as placer deposit.

Potential gold mining in Indonesia are located in North Sumatra, West Java, Middle Java, Middle Borneo, North Celebes, Nusa Tenggara, and Molucca including Halmahera and Obi.

The business of gold mining in Indonesia has been running long time ago, like in Rejang Lebong; Bengkulu; Cikotok; West Bolaang Mongondow; North Celebes, Sambas, West Borneo. Antam done the gold mining in West Java and South Borneo. Indonesia's production during 1995-1996 is 65,864.5 kg and silver is 163,119.6 kg. domestic gold sale is 3,747.2 kg and silver is 57, 258.7 kg; while the gold in 1996 is 60,022.8 kg.

Source:  
[www.mandailing.org](http://www.mandailing.org)

Picture 3.10 A gold miner in Batangnatah, North Sumatra

since Java; Inc. ltd. is gold kg. The exported

## 5) Copper

Copper is grouped into basic metal. It can be used for cable, electronic devices, and as cooking utensils. Copper mixed with iron will become bronze. Minerals that carry copper are natural copper containing 100% Cu, melancolite and cuprite which each contain 78.86% Cu, and Chalcocite which contains 79.80% Cu. The stones that contain copper will look green.

The largest copper producer region is Tembagapura of Papua which is run by Freeport Indonesia Company owned by the United States of America since March 3, 1973. Others are in Moluccas province, i.e. in Heruku island, Ambon, Nusa Laut, Sparua, and East Java.

## 6) Diamond

Diamond is one of crystal mineral containing Carbon element. It is formed in concurrently with the form of ultra basic stones such as peridotite and kimberlite coming from the name of the biggest diamond mining area in the world, i.e. in Africa namely Kimberley. Diamond crystal is formed in the depth of 95 km under earth surface with 1,500- 2000°C temperature.

In Indonesia, diamond is found in the river of Siabu, Kampar, Bangkinang, West Borneo, exactly in the estuary of Mengkiang and Ngabang, Middle Borneo, exactly in Kampung Sungai Gula, Pucukcau, Murungraya, and Sei Pinang. It is also found in South Borneo, precisely in Martapura and Simpang Empat and East Borneo exactly in Sekatak Bunyi, Kutai district and Longiran sub district.

Diamond mining business in Indonesia was firstly conducted in Martapura, South Borneo (1965). Diamond types which were so famous at that time are *trisakti*, *galuh campaka* and *galuh badu*.

### Active Self Practice

Mention some renewable and non renewable natural resources occur in your place.

Oil drilling		Sumatra
Coal		Borneo
Asphalt		Java
Manganese	Gold and silver	Celebes
Tin	Bauxite	Papua
Iron sand	Copper	Nusa Tenggara
Aluminum	Diamond	Moluccas
Marble	Nickel	

Source: The map of Indonesia and the world, 2002

Picture 3.11 The Map of Minerals Spread

### **C. Environmental-Based and Sustainable Management of Natural Resources**

In an ecological process of an ecosystem, human can be seen as the last consumer that needs everything. But in term of natural resources management, human changes and manages the use of these ecosystems. In natural resources management, human is not only the consumer, but also producer and manager. So, the management can be defined as conscious effort to maintain or improve the quality of resources to fulfill human's basic needs.

Along with the increase of human growth, the basic needs grow higher too. Moreover, the technology advancement has also successfully utilized existing natural resources to fulfill the needs. With this advancement, human beings may know many kinds of natural resources such as minerals beyond the earth, fish in the sea, and other various and more complex production systems merely to support human basic needs.

On the other hand, this advancement brings a bad effect, i.e., environmental damage. By degrees the environmental quality decreases, both biotic and abiotic factors. Finally, it gives less and stops being the natural resource to fulfill human's basic needs. So, natural resource management should always consider the balance of environmental capacity sustainability.

By having a wise planning, human will enjoy the advancement. The wise planning comprises procedures to keep the environment sustainable and useful for the future generation. Resource sustainability means using the resource wisely considering time aspect and resource limit.

Natural resource sustainability is part of environmental sustainability. It is recorded in the Law of Indonesian Republic number 4 in 1982 which states that the resources are environment elements comprising human resource, biological natural resource, non biological natural resource, and artificial resource. So, natural resource sustainability relates closely with the environment.

The importance of natural resource sustainability basically is to maintain the value of the resource over time. As the time passes, the value of the resource will decrease so the environmental quality will change. The change occurs at any time, for example, the climate changes, the sea level changes, and flora and fauna change. The objective of natural resource management is to sustain the environmental carrying capacity to support life.

Our country boosts balance-based natural resource management. The objectives are as follow:

1. to balance the relationship of human with the environment as one of the whole Indonesian development objectives
2. to utilize natural resources wisely and controllably
3. to shape Indonesians who love the environment and take role as the developer of the environment
4. to assure environment-based development sustainability for the sake of current and future generations.
5. to protect country from external influences that can damage and pollute the environment

Some principles of sustainable natural resource management in balancing the environmental capacity with the development are reduce the utility, reuse the utilizable natural resource, and recycle to reuse.

### **1. Reducing principle**

It means saving the use, controlling, being efficient in production, and looking for other alternate resources so human basic needs can be fulfilled and the development keeps continue for the sake of human prosperity.

### **2. Reusing principle**

One of the efforts in managing natural resources is by reusing the unused production. In daily life, there are many of the reuse concepts found, for example reusing the used bottle to place other products.

### **3. Recycling principle**

The human growth has required the availability of many and various natural resources. Rapid development of science ad technology is very useful for providing these many and various human basic needs. Variety of natural resources which in the past cannot be renewed by using technology they can be renewed in the original form or into the other forms

### **Active Self Practice**

- Observe your area. Is there any human activity which explores the natural resource that causes the environmental quality decrease or damage? Mention.
- Is there any activity of environment resources management in your area that applies recycle principle? Explain.

having different function. Some industrial product or ex-consumption rubbish is not considered as waste anymore, instead as resources.

Recycle principle is illustrated as follow. Plastic, paper, and some of metals rubbish can be recycled. Used plastic can be re-melted, added by specific substance it can be modified into new stuffs, whether like the original form or in other shapes

#### **D. The Use of Natural Resources based on Eco-efficiency Principles**

People often do not consider the surroundings when they conduct activities to fulfill their needs, as the result many suffer the loss. The development activities often follow by the entropy increase that is disordered. For example, forest clearing for settlement or plantation does not consider ecosystem sustainability. Meanwhile, if the principle of environmental-based sustainable development was taken into account holistically in applying these activities, life's carrying capacity can be got and the bad effect can be minimized. The other is the pollution resulted from industrial activities. Although pollution is inevitable, it actually can be reduced into an iota level.

Pollution is caused by waste; it is the disposal matter in a production process. By improving the production efficiency disposal material will decrease, as the result the need of raw material will also decrease. The decrease of production cost increases the benefit per unit of product so the company's competitiveness will increase. In the same time, as disposal material or waste decrease, the environmental impacts of industrial activities also decrease. So the improvement of production efficiency meets two aspects at once i.e. increasing the company's benefit and decreasing the environmental impact. Business management that combines economical efficiency and environmental efficiency is called **eco-efficiency**. Eco-efficiency technology minimizes the amount of waste by preventing excessive waste so the production process is cleaner.

The efficiency of natural resource use is the using them by maximizing wastage resources. The efficiency increase means reducing waste so minimizing environmental impact. Double effects resulted from the practice of resource use is called eco-efficiency. Efficient means economical efficiency and ecological efficiency.

Eco-efficiency should be started from a well household management. For example accurate material bookkeeping so none is expired, avoid the warehouse roofs leakage to keep the stored stuffs save from the rain water, and avoid the leakage of pipe, oil, and electricity. The improvement of the household management does not needs much money, rather it need careful and discipline human resources.

In addition to sustainability, the aim of this natural resource management principle is to provide better quality of life for balancing. Except the processing, the daily use of natural resources is also important. Luxury and consumptive lifestyle is a danger for sustainable development. This lifestyle has big impact to the resource depreciation. There are many people who behave as if the resources are unlimited.

Resource saving is a characteristic of simple lifestyle that can be measured quantitatively and objectively. For example, biking to school or walking if the distance is relatively close is energy-saving behaviour. It does not need any fuel so it helps decreasing the use of fuel. Resource saving means put priority for productive need instead of consumptive need. However, it needs also to consider the effectiveness and the efficiency for the humane use.

Another simple example of eco-efficiency is the use of non-lead super fuel. This fuel is economically more efficient as it results stronger power but more environmental-friendly because it does not disturb ecological principle.

**Pair Contribution**

- Give some examples of natural resource use based on eco-efficiency principle.
- Discuss with your friend about the behaviour of the youth nowadays who love motor vehicle convoying without precise destination.

## Summary

- Natural resource is all of natural wealth that is potential and possible to give prosperity by facilitating human needs and human viability.
- Natural resource is grouped into renewable, non renewable and unlimited resources.
- Types of renewable natural resource are farming, plantation, forestry, animal husbandry and fishery.
- Types of non renewable natural resource are oil, natural gas, geothermal, coal, lead, nickel, gold and silver. This natural resource is distinguished into energy resource and mineral resource.
- Resources that always available are the sunlight and the air.
- For the sustainability and optimum result, the utilization of used-value natural resources should be employed and recycling should be done so they can be reused for other functions.
- Eco-efficiency is business management which combines economical principal and environmental principle.

## CHAPTER 3 EVALUATION

### A. Choose one correct answer and write down your answer in your assignment book.

1. Some of the non renewable natural resources are.....
  - a. sun, water and mineral
  - b. land, air and water
  - c. oil, coal and minerals
  - d. farming, plantation and fishery
  - e. water, coal and natural gas
2. Based on mineral categorization stated in Law number 11 in 1967 feldspar is the mineral of group...
  - a. A
  - b. B
  - c. C
  - d. D
  - e. E
3. The oil producers in Sumatra basin are...
  - a. Minas and Duri
  - b. Cepu and Balongan
  - c. Wowoni and Buton
  - d. Barito and Sepinggan
  - e. Sorong and Babo
4. Avtur is the result of oil processing of... type.
  - a. fuel
  - b. non fuel
  - c. petrochemical
  - d. LPG
  - e. Lubricants
5. Rice field which watering depends only on rain water is called...
  - a. Non-technical ricefield
  - b. Technical ricefield
  - c. Limited irrigation ricefield
  - d. Rainfed ricefield
  - e. Rain water ricefield
6. Arabica coffee comes from...
  - a. Saudi Arabia
  - b. United of Arab Emirate
  - c. Ethiopia
  - d. Congo
  - e. Nigerian
7. The characteristic of civilian plantation is...
  - a. Having regular management
  - b. owned by civilian

- c. intensive
- d. having small capital
- e. mainly for export

8. Small animal husbandry comprises....
- a. quail and duck
  - b. rabbit and chicken
  - c. lamb and goat
  - d. cow and horse
  - e. pig and horse

9. A good rattan habitat is...
- a. coniferous forest
  - b. monsoon/seasonal forest

- c. tropical forest
- d. savannah
- e. steppe

10. Eco-efficiency can be reflected from the following activity...
- a. the use of superior seed in farming
  - b. minimizing the number of production waste
  - c. fertilizing technology that free of toxin
  - d. the use of energy saving machine
  - e. modifying the process and the equipment to be more sophisticated

**B. Answer the following questions correctly and write your answers in your assignment book.**

1. What are the characteristics of non renewable natural resources? Give some examples.
2. What are the types of animal husbandry? Give five examples each.
3. Mention the formation process of primary and secondary gold deposits (placer).
4. Mention some regions where nickel mining occurs.
5. Mention how the coal is formed.
6. What are the differences between civilian plantation and large plantation?
7. What does it mean by minerals type A, B and C? Give three examples each.
8. Explain the advantage of land for human beings.
9. What is the relationship between the high population growth and the natural resource existence?
10. What do you know about environment-based and sustainable natural resource management?

**C. Fill in the blanks below correctly and write down your answer in your assignment book.**

1. *Gogo* is a type of rice planted in.....ricefield.
2. The activity of natural resource investigation is known as.....
3. What animal is attacked by Anthrax disease?
4. The cotton spinning factory in Indonesia occurs in.....
5. Effort to improve farming yields by extending the farming area is called.....

## Periodical Competency Test

Objective: Students understand the importance of natural resource benefits for life.

1. Find data about forest product export.
2. Observe the data carefully.
3. What is the contribution of forest natural resources for the country?
4. Mention the relationship between forest natural resources and illegal logging.
5. Try to offer some solutions.

## Peer Assignment

### Protection forest of Saree was burnt

Some hectares of pine protection forest in Sukadamai, Saree, Aceh Besar was badly burnt. The head of Natural Resource Conservation Body of Nangroe Aceh Darussalam, Andi Basrul judged this forest was intentionally burnt by the community for their farm land.

Based on Kompas monitoring, Friday (25/8), the fire is still flaring in the area that is dominated by pine trees. Most of the burnt tree fell down on Trans Aceh Medan road covering some parts of the road. The fire also caused at least two electric towers in the forest edge were also burnt and fell down and five towers were almost fell down so made an electricity failure.

Around the forest, untouchable by fire, land squatting has occurred and the land there has become the farming area. "We presume that this fire is willfully done by irresponsible persons for farm land," he said.

Andi said that fire occurs since last week. Some days ago he has wrecked fire fighters from Banda Aceh, but they cannot control the fire since it was too strong.

A local inhabitant who did not want his name to be mentioned said this area actually has been put into some lots by the local inhabitants since 1998. The burn was intentionally done to clean the land before it is turned into the farm land.

This activity is usually done in the dry season. "Many citizens have had the land certificate of this forest. At least 17 certificates have been made. In average, each certificate is for two until three hectares land. We do not know how they can get the certificate while it is clear that this is a protection forest," he said.

Every dry season, the citizens who have had the certificate intentionally burn the forest. Andi also admitted that the fire in this area was intentional." This area is clearly parts of the forest so the actor can be penalized," he said.

### Hundreds Hectare

Andi said, except in Saree forest, forest fire also occurs in Bener Meriah, Takengon and Aceh Singkil. "The total width of forest fire in Aceh is hundreds. We have no power to stop it," he said.

Based on Kompas observation a couple days ago through the air, some firing points are seen in some forest area starting from Banda Aceh up to Bener Meriah. At least there were ten firing points. Most of the fire is seen in the slope of Selawah Mountain, Aceh Besar.

Quoted From "Hutan Lindung di Saree dibakar" (Protection forest in Saree was burnt).

Source: Kompas cyber, 25 August

1. Make a group of four.
2. Read the article carefully.

3. Answer the following questions:

- a. Explain what happened in the article.
- b. Explain the causes.
- c. Explain the loss that the local society and environment around the forest should get.
- d. Explain steps that should be done by the government and society around the forest.
- e. What is your group opinion about this phenomenon?
- f. Link up the phenomenon above with the eco-efficiency of natural resource use principle.

## Semester 1 Evaluation

**A. Choose one correct answer and write down your answers in your assignment book.**

1. In a census, the officer only makes written recording. This is called...
  - a. census
  - b. *de jure* census
  - c. *de facto* census
  - d. citizen registration
  - e. citizen survey
2. As border of relief area, Wallace and Weber lines also function as the border of flora and fauna spread and the rule is...
  - a. Weber line limit the spread of East and Middle Fauna
  - b. Weber line limits the spread of West and East fauna
  - c. Weber line limits the spread of middle and west fauna
  - d. Wallace line limits the spread of west and east fauna
  - e. Wallace line limits the spread of middle and west fauna.
3. In 1980 most of Indonesian population is in village and farmer was the main occupation. This fact shows that there is a relationship between...
  - a. Occupation and education level
  - b. Occupation and living place
  - c. Income level and living place
  - d. Income level and education level
  - e. Living place and education level
4. Population pyramid is organized as gravestone inscribed with a note that the population of a country is growing. It shows...
  - a. the dependency rate of the country is high
  - b. the dependency rate of the country is low
  - c. buying power of the society in the country increase
  - d. the education level in the country is low
  - e. the education level in the country is high
5. In 1981, the population number of X was 147.4 million, natality 39 and mortality 15.4. So the natural population growth rate in X in 1981 was categorized into...
  - a. very high
  - b. high
  - c. medium
  - d. low
  - e. very low

6. Special characteristic of Indonesia's sea natural resource can be distinguished from Soviet Union, Sweden, Finland, and Iceland. The sea natural resource of Indonesia is beneficial because it is...
  - a. open
  - b. very large
  - c. unimpeded/free
  - d. high salinity
  - e. the neritic zone is larger than abyssal zone.
  
7. Early data in 1988 showed there were 7,500 millions populations of RW 3 Kelurahan X, 45% natality, 25% mortality, 19 new inhabitants, and 9 moving out inhabitants. The total of population number in the area at the end of the year was...people
  - a. 8,992
  - b. 9,010
  - c. 8,007
  - d. 7,660
  - e. 8,660
  
8. Indonesian population in 2001= 223.8 million, the growth rate was 3.5 % a year. The number of Indonesian population will be doubled in...
  - a. 2012
  - b. 2021
  - c. 2020
  - d. 2010
  - e. 2015
  
9. Bayu lives in Bekasi and he works as Jakarta. He is registered as Bekasi's Citizen. This kind of census is called...
  - a. de jure
  - b. de facto
  - c. canvasser
  - d. citizen registry
  - e. census
  
10. The health level of a country can be reflected from the level of...
  - a. Rough mortality
  - b. Baby's mortality
  - c. mortality based on age
  - d. mortality based on sex
  - e. birth based on sex
  
11. Based on the world biogeography region, Indonesia is involved in
  - a. neotropical
  - b. Palearctic
  - c. Nearctic
  - d. Ethiopian
  - e. Oriental
  
12. Factors influencing the population growth are...
  - a. natality, mortality and emigration
  - b. natality, mortality and immigration
  - c. natality, immigration and emigration
  - d. natality, mortality and migration
  - e. natality, immigration and emigration
  
13. The main factor influencing Indonesia's population growth is...
  - a. migration
  - b. early marriage
  - c. mortality
  - d. KB (Family Planning)
  - e. natality
  
14. The government effort to decrease baby mortality is by advising the citizens to go to...
  - a. public hospital
  - b. integral service post (Posyandu)
  - c. community health center
  - d. polyclinic
  - e. midwives
  
15. Weber line separating eastern and western part of Indonesia is characterized by the existence of...
  - a. elephant
  - b. paradise bird
  - c. babirusa
  - d. squirrel
  - e. deer
  
16. Eastern Indonesia fauna is typically....
  - a. Weber
  - b. Wallace
  - c. Australian

- d. Asiatic
  - e. Transition
17. Forest consisting only of one kind of tree is called...forest.
- a. heterogeneous
  - b. dense
  - c. homogenous
  - d. artificial
  - e. protection
18. The example of seasonal forest is....
- a. savannah
  - b. teakwood
  - c. steppe
  - d. tropical
  - e. subtropical
19. The following does not belong to the biome of temperate climate
- a. coniferous forest
  - b. temperate rainforest
  - c. Sclerophyll forest
  - d. Sclerophyllous forest
  - e. mangrove
20. Orangutan is a native animal of....
- a. Palaearctic
  - b. Nearctic
  - c. Ethiopian
  - d. Oriental
  - e. Australian
21. Hippotamus is a native animal of...
- a. Palaearctic
  - b. Nearctic
  - c. Ethiopian
  - d. Oriental
  - e. Australian
22. Panda is a native animal of...
- a. Palaearctic
  - b. Nearctic
  - c. Ethiopian
  - d. Oriental
  - e. Australian
23. Komodo is a special animal belongs to the fauna of ..... Indonesian region.
- a. eastern
  - b. western
  - c. middle
  - d. northern
  - e. southern
24. Fishpond placed in estuary and near the seashore is called...
- a. sea fishery
  - b. salty water fishery
  - c. brackish water fishery
  - d. freshwater fishery
  - e. salty and freshwater fisheries
25. Ricefield located in the right side and the left side of a river is called...
- a. rainfed ricefield
  - b. valley ricefield
  - c. tidal ricefield
  - d. irrigation ricefield
  - e. dry ricefield

**B. Answer the following questions correctly and write down your answers in your assignment book.**

1. Explain the meaning of population census.
2. Explain the meaning of Epiphyte. Explain three characteristics of epiphyte.
3. In 2004 the population number in Tegal subdistrict is 5,000 and during 2004 until 2006 there were 540 births and 320 deaths. There were 90 people who moved in and 41 who moved out. What is the percentage of population growth?
4. What is the difference between house holder method and canvasser method?
5. Explain five groups of renewable natural resources.

## Chapter 4

# Environment

### Learning Objectives

After learning this chapter, students understand the importance of environment and its benefits for their daily lives.

The relationship between human and its environments is interesting. It is because human being has interrelated functions, roles, and positions. In the figure below, we can observe sources of river pollution in Surabaya. The source of the pollution is mostly from industrial wastes. Such condition causes a decrease in the quality of water in rivers in Surabaya. Therefore, a system of interaction between human being and other environmental elements is required. It is to create harmony and preservation for them to survive. Are we aware that human being as one element of environment is also responsible to maintain its preservation?

[FIGURE]

Source: [www.terranel.or.id](http://www.terranel.or.id)

Figure 4.1 Industrial wastes of river in Surabaya.

### Keywords

- Abiotic
- Biotic
- Ecology
- Conservation

### Conceptual Map

Environment

Environment

Ecological Limitation

Elements of Environment

Area Distribution

Conservation

Area Identification

Conservation

Biotic Environment and Abiotic Environment

Quality of Environment

Components of Physical Environment

Biological Components

Human Resources and Artificial Resources

Definition of Conservation

Damages in Conservation Area

Importance of Conservation Area

Nature Preserve Area

Natural Conservation Area

## A. Environment

Law No. 23 of 1997 Article 1 paragraph (1) defines environment as a space in unison with all objects, powers, conditions, and organisms including human being and their behaviors which influence the life and prosperity of human being as well as other organisms.

### 1. Biotic and Abiotic Environments

In general, environment in macro ecological context can be grouped into two categories, namely biotic and abiotic environments. **Biotic environment** means any organism from microorganism to plant and animal, including human being. **Abiotic environment** means any condition around living organisms which is not living organism, such as rock, soil, mineral, and air. Biotic environment is often called **organic environment**, whereas abiotic environment is named **inorganic environment**.

By functions in ecosystem, biotic factors can be grouped into three, namely producer, consumer, and decomposer. **Producer** means any organism capable to produce organic materials from inorganic substance. **Consumer** means any organism which is unable to synthesize its food by itself. **Decomposer** means any organism decomposing organic compound into inorganic one or to any simpler compound.

Biotic factors may form one ecosystem unity including individual, population, and community. Individual is a name for single organism, population is a group of similar individuals occupying certain area, whereas community is all populations of organism collectively living in certain area.

Abiotic factors of ecosystem consist of all dead objects around organism such as land, water, air, light, temperature, air humidity, and topography.

According to Human Ecology, environment is a branch of ecological science learning mutual relationship between human and environment. Such environment is divided into three groups, namely natural environment, social environment, and cultural environment. Natural environment means natural condition whereas social environment is human being both as individual and social creatures. Cultural environment constitutes products of human activities in form of will, work, and sense.

Source: [www.google.com](http://www.google.com)  
Picture 4.2 mutual relationship in an ecosystem

Regarding the definition and scope of environment, it is clear that environment does not only include plants, animals, and humans but also non-living objects in it and they build building interrelated relationship including human behaviors. The scope of environment is so wide that it does not only cover physical environment but also non-physical ones. Therefore, the discussion on environment will involve several experts from certain disciplines such as biology, geography, chemistry, physics, economics, sociology, and anthropology as well as religion.

## **2. Environment Quality**

The quality of environment is very important since it is the basic as well as the target to reach the objectives of environmental management. Environmental management is aimed at making the environment as a meaningful contribution for survival.

In a simple way, good environmental quality is any condition of making every individual **stands to live** in the environment. This atmosphere is resulted if someone gets comfortable climate, proper resources, and mutually social intercourse. Thus, to support good environmental quality, many factors may influence. Therefore, environmental quality is also holistic. It regards all components of environment as a unity.

Quality environment can be classified by biophysical, socio-economical, and cultural factors.

a. Biophysical environment means any abiotic and biotic environments having symbiosis relationship. Abiotic or physical environments include, among others, rock, land, mineral, air, water, solar energy, and any processes inside or on the earth. Biotic environment means any organism from microorganism that can not be viewed with bare eyes to giant animals and plants. Quality of biophysical environment can be said well if among arising interaction systems generate harmonious life. If one of the systems is damaged or polluted, its quality will decrease or even be destroyed at all.

b. Social environment constitutes human beings both in individual and group. Quality standard for socio-economical environment is good if human life is economically welfare, having no deficiency on clothing, food, housing, and other needs. Adequateness of such needs, of course, will exist if their incomes are low. It means that socio-economic quality can be created if social environment is welfare and has proper sources of income.

c. **Cultural environment** means any condition both material or object and non-material ones produced by human through its activity and creativity. Cultural environment includes, among others, building, equipment, weapons, and clothes. In addition, cultural environment also covers value system, norms, institutions, regulation, political system, arts, and economic system. Quality standard for cultural environment can be said well if the environment can provide with life comfort. Social system and value can guarantee security and welfare to human as member of society and individual.

#### **A. Self-Active Exercise**

Observe your environment. How is its quality of the environment including biophysical, socio-economic, and cultural aspects?

#### **B. Ecological Limitation**

Source: [www.perso.easynet.fr](http://www.perso.easynet.fr)

Figure 4.3 Ernest Haeckel

The term *ecology* was initially introduced by a German biologist, Ernest Haeckel. According to Haeckel, ecology is derived from *oikos* meaning household and *logos* meaning knowledge. Thus, ecology means a kind of knowledge on dynamically mutual relationship between organisms and their households or environments. At the same time, according to Miller, ecology is knowledge on mutual relationship among organisms and organisms and environment where they live. If we talk about ecology, we will talk about term ecosystem.

Ecosystem means an intact unity system covering all elements of environment influencing each other. Elements of environment include, among others, human resources, bio-resources, non-bio-resources, and artificial resources. Ecosystem will function if it has energy flow and material recycle. Energy flow means transfer of energy in food chain. It starts from the first chain or producer to consumer and ends to decomposer. If products of decomposing are in form of mineral elements returned to producer, material cycle will be formed. In chain of energy flow, plant is consumed by rat, rat is consumed to snake, snake is consumed by bird, bird is consumed by wolf, wolf is consumed by tiger, and finally, tiger is hunted by human. Pair of plant-rat is inter-species relationship of prey and predator. Pair of rat-snake, rat is prey and snake is predator. For each pair, prey is consumed by predator, but it is never extinct.

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For example, plant and rat. Although the plants seem to be finished, their roots will produce new plants. Rats are consumed by snakes, however, there will be some rats left so that they will grow and survive. Such event happens along food chain. A constant condition with plants and animals where they are not extinct and still survive is called equilibrium or homeostasis. Homeostasis peak means limit of carrying capacity for any ecosystem. Carrying capacity means any natural capacity of ecosystem to survive and grow. In case ecosystem's carrying capacity gets inputs in form of knowledge and technology, accommodating capacity will be created.

Any population continuously growing and exceeding its carrying capacity will press down the carrying capacity. Too high pressure on carrying capacity causes reduces in carrying capacity to support life so that number of population decreases. Based on above description, it is clear that the role of environment to life can not be forced. If carrying capacity is exceeded, environmental damages will happen. Limitation of carrying capacity is called ecological limitation.

Such ecological limitation will be more perceived along with population growth and decrease in natural resources. Therefore, to anticipate ecological limitation, following efforts should be made:

1. To keep environmental preservation and to make environment productive for human beings;
2. To save natural resources so that they will not be quickly finished through the creation of sophisticated and energy-saving technology;
3. Development planning with environmental conception.

### **C. Elements of Environment**

Elements or components of environment basically consist of:

1. Physical components (abiotic environment) like soil, rock, and climate;
2. Biological component (biotic environment) like plants, animals, and microorganisms.
3. Human resources and artificial resources as products of human works and wills as their cultural environment.

The three elements can not stand alone but they are related each other. Any change in one element will influence others. Thus, environment is a system where it comprises various sub-systems.

Those sub-systems are called elements or components of environment. Human and other organisms living on earth occupy certain spaces. In addition to living organisms, non-living organisms are found on the space. Both living and non-living organisms are interrelated.

Relationship between human and environments occurred since human is born. At the same time, human had needed environment including clean water to breathe, water to drink, clothes, and home to protect him/herself from cold and hot weather, in which all those materials are from nature.

Basically, human can survive since it is contributed by elements of environment. Thus, benefits of environments for human are as follows:

1. Air for respiration. No human can survive without air.
2. Water for drinks, taking a bath, and electrical generator. Moreover, clean water has been economic object in urban area. You may often buy packaged water for drinks where its one-liter price is higher than fuel's price.
3. Plants and animals are sources of animal and vegetable proteins. Other than sources of food, plants and animals can also be sources of power and pleasure. In certain areas, buffalos and bulls/cows are used to pull plows in rice field and horses are used to carry wagon or means of horse riding sports. You need to be aware that oxygen we breathe from the air mostly comes from plants during photosynthesis process.
4. Land for constructing personal and social infrastructure. Dwelling is used to protect human from heat and rain as well as functions as social facilities like governmental, sport buildings, and shopping center where all are built on land. Not limited to such matters, if we observe rural areas, farmers will do their routines on land. In fact, interactions or relations among elements of environment do not only centralize on human beings. Other than interactions of humans to their environments, several other components also interact for their survivals. For example, inter-physical components like climate and soil influence lives of biological components very much like plants requiring water, fertile soil, and air. Biological components can also influence continuity of physical components. For example, soil worms living in soil may help to fertilize and to enrich soil nutrition that it will be fertile. For ecosystem balance, other than using those elements, human resources should also be able to synergize and to preserve them for ecosystem balance.

## **D. Identification of Conservation Area**

### **1. Definition of Conservation**

Many people still regard conservation as protecting objects and products from damages. Therefore, they think conservation is any action to prevent development because conservation does not wish any change and change may cause damages. In fact, objective of conservation is to support sustainable development. To avoid comprehension that conservation prevents development, it needs a clear definition on conservation as a support for sustainable development and organism preservation.

**Definition of conservation** put in world conservation strategy and adopted by Indonesia in its Law Number 5 of 1990 is a sustainable biosphere management to obtain benefits for current generation and future generations.

Conservation is aimed at keeping environmental quality for life from pollution as well as protecting land, flora, and fauna for sustainable human species life in meeting needs on food and other raw materials. Thus, conservation can be defined as a wise use of natural resources and human resources.

### **2. Damages in Conservation Area**

Nowadays, environmental damage has become a global issue because any damage occurring in one country will also impact to other countries. One form of environmental damages currently being global issue includes the damage of land, water, forest, and environmental pollution. For example, forest fire in any area will be perceived by several other areas.

Land means any area on the earth with certain characteristics influenced by climate, rocks, soils, vegetations, forms, and uses of land, fauna, and human living on it.

Indonesia in particular, land conservation is required because of the contradiction between the need to extend residential and industrial areas and the environment limit as well as the increase of basic needs in rural area without the extension of job opportunities.

Other than human factor, natural factors may also damage land productivity, among other are degradation and aggradations. Land **degradation**, for example, is caused by erosion and mass wasting whereas **aggradations** means a surface increase due to sedimentation whether by surface process, waves, tidal current, wind, or by glacier. Damaging process may also occur as a result of endogenous process, namely diastrophism and volcanism.

Such environmental damages actually happened in very complex ways. Meaning that damages do not only relate to physical damages but also all elements or components of environment. Components of environment do not only cover physical environment but also biological and socio-cultural environment system.

Several forms of environmental damages those can be found now include as follows:

a. Floods in rainy season and dryness in dry season. More cleared forests indirectly cause very low level of rain water infiltration. In case level of infiltration is low, during rainy season, surface water flow will be very high and may cause erosion and floods. In addition, low level of infiltration causes rain water unable to store on soil layer so that there will be no lack of water during dry season.

b. Global temperature increase. The rise of air temperature is closely related to the increase of cleared forests and carbon dioxide emission level. Such carbon dioxide is obtained from human activities like motor vehicles, industries, and cigarette smokes. Carbon dioxide emission level in the atmosphere increases and is difficult to neutralize. Finally, such a condition causes greenhouse effect. Greenhouse effect happens due to increase in CO<sub>2</sub> gas emission in space. Such increase causes ray of sunlight be reflected to sky again and blocked by CO<sub>2</sub> layer. Finally, it is reflected to earth surface being hotter.

c. Soil, water, and air pollutions. Soil pollution happens since many people taking benefits from fertilizers and artificial drugs without considering rules in agricultural activities.

d. Water pollution also happens in watershed passing through industrial area. Industrial liquid waste is generally disposed to river. In case industrial liquid waste is not firstly recycled, river water will be blackish brown and have odors. In case the water is used for taking a bath, it may cause skin irritation and skin diseases.

e. Mountainous piled wastes will generate odors and invite flies and mosquitoes. Flies and mosquitoes may spread various diseases. High amount of wastes is closely related to population density.

Source: [www.indomedia.com](http://www.indomedia.com)

Figure 4.4 Mountainous wastes on Musi River edge become environmental problems.

f. Acid rain. Acid rain means any rain with high acidity level which its pH value is less than 5.6. Rain water becomes acid because it is contaminated by sulfur dioxide and nitrogen oxide.

Main sources of sulfur dioxide are industries with coal fuel, whereas sources of nitrogen oxide are motor vehicles. Acid rain will damage buildings, Lake Ecosystem, forest, and agricultural plants. Thus, such acid rain will happen anywhere, especially in industrial area.

g. Landslide, roots of trees in forest function as land arrester to prevent erosion and landslide. Because the trees have died, such function cannot go properly so the landslide occurs.

h. Unemployment, poverty, brawl, and wars are forms of environmental damages, precisely socio-cultural environment. Sources of damage of socio-cultural environment are very complex. They include low education, law enforcement without any attention to justice sense, and corruption, collusion, and nepotism practices. All environmental damages both physical and socio-cultural ones are basically closely related to people's mental quality. To be capable in building human mental that is wise to environment, we can use education including both school education and out-of-school education.

### **Pair Contribution**

Increase in earth temperature is caused by, among others, greenhouse effect. Describe what greenhouse effect is, what causes it, and what impacts other than increase in global temperature.

### **3. The Importance of Conservation Area**

Soil and water needs conservation since they are natural resources as media for producing human foods. Land conservation means any efforts to keep soil productive whereas water conservation means any efforts to keep water stored in ground so that it can be used by plants and reduce floods and erosion.

Scarce flora and fauna have also to conserve or to protect so that they will not disappear. Therefore, in general, scarce fauna lives are closely related to their habitats. Usually, protecting scarce fauna will be along with protecting their habitats in form of nature reserve and wildlife preserve.

In relation to such matter, the government had issued many rules on environmental regulation and management. Recent law on environment is Law Number 23 of 1997 regarding Environmental Management. To implement the law, regulations of government and decrees of related ministries were issued. Some of them are Regulation of Government No. 27 of 1999 regarding Environmental Impact Analysis, Regulation of Government No. 19 of 1999 regarding Lake Pollution Control or Sea Destroyer, and

Regulation of Government No. 41 of 1999 regarding Air Pollution Control. Any area requiring conservation

a. Aquifer

Rain water dropped to earth surface will penetrate to ground and be flowed to be water stream and then go to the sea. Upstream area is any area generally in upland with mountainous topography often called aquifer.

Aquifer means any area need to protect since it is the only area saving ground water in the watershed. If this area is damaged and can not “catch water” anymore so that it can not penetrate water to the ground in rainy season, floods will happen, and dryness will happen in dry season.

Other than damages to aquifer as water source, river water can be damaged if it is polluted by industrial wastes. Therefore, waste treatment is required so that there will be no environmental pollution.

b. Erosion and Landslide Danger Area

Such area is usually found in hilly place with steep slope, thick soil layer, and high rainfall. If this area is not protected, landslide may happen. If soil layer is brought, it may cause infertile and empty land or landslide. They may cause disasters for human life as currently happened. For example, those happened in Banjarnegara, Central Java, Jember, East Java, and other areas in Indonesia.

The protection is by allowing the area to be natural forest. Furthermore, if the forest has been cleared, deforestation with annual crops must be done. Deforestation must not be disturbed or treated by human beings.

Source: [www.didats.warplet.com](http://www.didats.warplet.com)

Figure 4.5 Coastal abrasion of Jimbaran, Bali.

c. Potential and Fertile Land

Potential and fertile land means very productive agricultural land. This area needs to be protected since it is a natural resource producing foodstuffs. Potential area is protected by keeping the land so that it is not transferred into industrial land or residential area as well as by protecting it from any pollution.

d. Forest

Untreated forest may cause floods, erosion, landslide, and fire. We need to preserve and to treat protected forest as aquifer and scarce animal and plant habitats.

This area needs to be protected since it may preserve scarce animals and plants living in it. Distribution of such conservation area will be described in last part of this section.

e. Sea

Sea is a place for beautiful aquatic animals like fish, squid, and coral reef. Sea pollution may be caused by oil spills or leaks of tankers or fishing using explosive materials. Coastal area with its mangrove forest needs to be protected to hold abrasion of sea waves hitting the coast. In addition, this forest is habitat for certain fish spawning in sea side.

f. Industrial Estate Area

Industrial estate area is main factor for acid rain. It is caused by air pollution from combustion of factories using coal fuel as release source of sulfur dioxide and motor vehicles as sources of nitrogen oxide release to the air. Therefore, all people should be aware of it.

### **E. Distribution of Conservation Area**

Law No. 5 of 1990 regarding Bio-Resources and Their Ecosystems sets about conservation area and its classification including, among others, as follows:

1. Natural Preserve area means any area with special characters both on land and waters with main function as area preserving diversity of plants and animals as well as their ecosystems. It functions as life holding system including following matters:

a. Nature preserve area is any natural sanctuary area that due to its natural condition having special plants, animals and ecosystems or certain ecosystems required to protect and such development occurs naturally.

b. Wildlife sanctuary area is any natural sanctuary area having special characteristics of variety and or uniqueness of animals those for their survival, their habitats can be developed.

Source: [www.terrambiente.org](http://www.terrambiente.org)

Figure 4.6 One-horned rhinoceros is special animal in Ujung Kulon, Banten.

2. Natural Conservation Area means any area with special characteristics both on land and waters area. The area functions as life holding system protection, plant, and animal species conservation as well as taking benefits from bio-resources and their ecosystem in preserving methods.

Natural conservation area includes national garden area, natural park area, and great forest park area.

a. National park area is any natural preservation area having original ecosystem. It is managed under zoning system and is utilized for research, science, education, cultural support, tourism, and recreation.

b. Natural tourism area means any natural conservation area mainly for tourism and natural recreation interests.

c. Great forest park is any natural preservation area aiming at collecting natural and non-natural plants or animals, original and or non-original species, used for research, scientific, educational, cultivation, cultural, tourism and recreational objectives.

Source: [www.lablnc.or.id](http://www.lablnc.or.id)

Picture 4.7 in ridge of rock in Kepulauan Seribu is one National sea part area in Indonesia

Source: [www.creative.gettyimages.com](http://www.creative.gettyimages.com)

Figure 4.8 Forest of North Sumatra as conservation area

Pair Contribution

Do following task with your friend on a sheet of blank paper. Mention several national parks and their locations. Write down your answer based on following table:

No.	Conservation Area	Province
1.	Kutai	East Kalimantan
2.		
3.		
4.		
5.		
6.		
7.		
8.		

By virtue of provisions of Law No. 41 of 1999 regarding Forestry, we have forests and their classification including, among others, as follows.

Forest area means any region selected and or determined by the government. Its condition is kept as permanent forest. The government determines forest by main function, namely conserved forest, protected forest, and productive forest. Conserved forest means any forest area with special characteristics and functions to preserve diversity of plants and animals and their ecosystems. It includes, among others, as follows:

a. Nature preserve forest area means any forest area with special characteristics and main functions to preserve diversity of plants and animals and their ecosystems. This area also functions as life supporting system area.

b. Natural conservation area means any area with special characteristics. The conservation mainly functions as life buffer system zone, plant and animal species conservation as well as taking benefits from bio-resources and their ecosystem in preserving methods.

c. Hunting park means any forest area determined as hunting tourism area.

Recapitulation of conservation areas in Indonesia can be found in following table:

Table 4.1 Recapitulation of conservation areas in Indonesia

No.	Names of Conservation	Number (Unit)	Area (Ha)
<b>1.</b>	<b>Nature Reserve</b>		
	a. Land	228	4,456,488.59
	b. Sea	9	274,215.45
	Total	237	4,730,704.04
<b>2.</b>	<b>Wildlife Sanctuary</b>		
	a. Land	70	5,083,704.54
	b. Sea	7	339,218.25
	Total	77	5,422,922.79
<b>3.</b>	<b>National Park</b>		
	a. Land	42	12,165,845.14
	b. Sea	8	4,218,349.00
	Total	50	16,384,194.14
<b>4.</b>	<b>Natural Tourism Park</b>		
	a. Land	101	300,411.73
	b. Sea	18	765,500.70
	Total	199	1,065,912.43
<b>5.</b>	<b>Great Forest Park</b>	21	343,454.41
<b>6.</b>	<b>Hunting Park</b>	15	219,392.49
	<b>Total Land Conservation Area</b>	477	22,569,296.00
	<b>Total Sea Conservation Area</b>	42	5,597,283.40
	<b>Total Conservation Area</b>	519	28,166,580.30

Source: [www.ditjenphka.go.id](http://www.ditjenphka.go.id)

## Summary

- Good environmental quality is any condition making every organism feeling home in the environment.
- Environmental quality can be classified into biophysical, socio-economic, and cultural environment.
- Efforts to overcome ecological limitation include, among others:
  1. to make efforts on remained environmental preservation;
  2. to save natural resources through technology and energy saving;
  3. to plan an environmental-based development.
- Elements of environment basically comprise physical environment, biological components, and human resources.
- Any area needs to conserve includes, among others, aquifer, erosion, landslide danger area, potential land and fertile land, forest and scarce animal and plant habitats, sea, and industrial estate area.
- For bio-conservation, the government of Indonesia determines any area to be nature reserve and natural preservation area.

## Chapter 4 Evaluation

### A. Choose one best answer and write down your answers in your task book.

1. Environment as a space unity with all objects, powers, conditions, and organisms including human being and their behaviors influencing continuity of human's and other organisms' lives. Such definition of environment is found in ....
  - a. Law No. 25 of 1997
  - b. Law No. 26 of 1997
  - c. Law No. 27 of 1993
  - d. Law No. 23 of 1997
  - e. Law No. 23 of 1999
2. Public figure who stated that ecosystem is a mutual relationship system between biotic and abiotic components is ....
  - a. Ernest Haeckel
  - b. Miller
  - c. Emil Salim
  - d. the Government of Indonesia
  - e. Walhi
3. In any ecosystem, plant plays a role as ....
  - a. producer
  - b. consumer level II
  - c. decomposer
  - d. consumer level III
  - e. consumer level I
4. Fly larva in ecosystem has the most important role, namely as ...
  - a. producer
  - b. consumer level I
  - c. consumer level II
  - d. consumer level III
  - e. decomposer
5. In simple way, ecology is a science studying household and ....
  - a. human
  - b. animal
  - c. plant
  - d. plant and animal
  - e. environment

6. The balance lost in ecosystem may happen because of ....
- broken food chain
  - inter-component competition
  - holistic components
  - complementary components
  - interrelated components
7. Any natural preservation area having original ecosystem, managed under zoning system and utilized for research, science, education, cultural support, tourism, and recreation is ....
- great forest park area
  - national park area
  - tourism park area
  - nature preserve area
  - wildlife preserve area
8. Conservation effort by *terracing* system is conservation by ....
- physics
  - mechanics
  - chemistry
  - vegetative
  - artificial
9. One of efforts to overcome dryness is ...
- land reclamation
  - land clearing
  - river dredging
  - dam construction
  - stimulating rainfall
10. Bio-Resources Conservation and Their Ecosystems are regulated in law number ....
- 5 of 1990
  - 9 of 1990
  - 19 of 1995
  - 9 of 1995
  - 25 of 1990

**B. Answer the following questions correctly and write down your answers in your assignment book.**

- Explain how the ecosystem damages happen.
- Mention some areas that need conservation.
- What are population, community, habitat, and ecosystem? Give your examples!
- How can coastal abrasion be prevented?
- Mention any components constituting environment.
- How is the relationship between human beings and the environment?
- What is nature preserve area?
- What is acid rain? What are its main causes?
- What conservation efforts can be done to preserve soil and water?
- Mention five National Park areas of Indonesia.

**C. Fill in following blanks correctly and write down your answers in your assignment book.**

- Environmental element system as one unity and interaction is called ...
- A group of similar individuals occupying certain area is called ....
- Conservation area of Karimata islands is habitat and biota for ....
- National Park of Aceh is ....
- Ujung Kulon national park is a habitat for ....

## Periodical Competency Test

Objective: Students can comprehend environmental preservation and its benefits for life.

1. Find any article on environmental damages happening in local areas.
2. Answer following questions and write down your answers in a sheet of blank paper!
  - a. What causes such damages?
  - b. What are their impacts on human life?
  - c. What solutions can you give to solve such problems?

## Peer Assignment

### Indonesian Forests May be Extinct in 15 Years

Nusantara Green National Committee, Ary Sudarsono, said that all forests of Indonesia are predicted to extinct in 15 years later if no serious efforts are made by the government.

"By damage level reaching 2.8 million hectares per year, it is predicted that Indonesian forest will be finished in 15 years later," he said in his press conference, Sunday (12/3).

According to him, for period of 2000-2006, 59.2 million hectares out of 120.3 million hectares of forest have been damaged. "If all forests are damaged, natural disaster from landslide, floods, and dryness will happen everywhere," he said.

According to Ary, forest damages may also cause extinction of 27,500 flowery plant species (10 percents of total plants on the world), 1,539 bird species (17% of total birds on the world), 515 mammal species (12 percent of total mammal species on the world), and 270 amphibian species (16 percent of total amphibian on the world).

Therefore, Nusantara Green National Committee will campaign natural preservation on any events related to sports, arts, and cultures.

Quoted from "15 Tahun Lagi Hutan di Indonesia Bisa Punah". Source: *Kompas Cyber*, 12. March 2.006 with adjustment.

1. Make a group of four.
2. Read above article carefully.
3. Answer following questions correctly.
  - a. What are the causes of abovementioned forest damages? Explain.
  - b. What should people do to keep their environment?
  - c. What are short-term impacts for any organisms living in damaged area? Explain.
  - d. What are long-term impacts for any organisms living in damaged area? Explain.

## Mid Term Examination

### A. Choose one of the best answers and write down your answers in your assignment book.

1. Law no. 23 of 1997 article 1 paragraph (1) defines environment as....
  - a. the unity of space with all things and power influencing human's life and prosperity.
  - b. the unity with all, thing, power, condition, and living organism including human and his behaviour influencing human's life and prosperity.
  - c. the unity of space with all power, condition, and living organism including human and his behaviour influencing human's life and prosperity.
  - d. the unity of space with all condition, living organism, including human and his behaviour influencing human's life and prosperity.
  - e. All answers are true
2. (1) individual (3) community (2) population (4) habitat  
The name of individual living thing and a place of life of living thing are number...
  - a. 1 and 2
  - b. 2 and 3
  - c. 1 and 4
  - d. 2 and 4
  - e. 3 and 4
3. Community is...
  - a. name for individual living organism.
  - b. organism that does not synthesize its own food.
  - c. all population of living organism live together in a particular place.
  - d. a group of homogeneous individuals live in a particular area.
  - e. Living organism that able to result organic matter from inorganic matter.
4. Biophysical environment is...
  - a. abiotic environment that relates symbiotically.
  - b. biotic environment that relates symbiotically.
  - c. Biotic and abiotic environment that relate symbiotically
  - d. Environment that consists of human being, whether individual or social.
  - e. Environment that consist of material or thing or non material resulted by human beings through their activity and creativity.
5. (1) ecosystem (3) carrying capacity (2) homeostatic (4) energy current  
A static condition with the existence of non extinct and sustained plants and animals also the move of energy in the food cycle are represented by number...
  - a. 1 and 2
  - b. 2 and 3
  - c. 1 and 3
  - d. 1 and 4
  - e. 2 and 4
6. Carrying capacity is...
  - a. a static condition with the existence of non extinct and sustained plants and animals
  - b. the holistic and comprehensive unity arrangement that influence one into another.
  - c. The natural ability of ecosystem to maintain live and growth.

- d. The move of energy within food cycle  
 e. The ability of ecosystem that get input from science and technology
7. Environmental components consist of...
- physical, biological and chemical
  - physical, biological and ecological
  - physical, biological and human resource
  - biological, ecological and human resource
  - chemical, human resource and artificial resource
8. (1) air (3) desert  
 (2) water (4) mountain range  
 The followings that belong to the benefits of living environment for human are number...
- 1 and 2
  - 2 and 3
  - 1 and 3
  - 1 and 4
  - 2 and 4
9. The definition of conservation in the "world conservation strategy" is adopted by Indonesia which is manifested in...
- Law No 5 of 1990
  - Law No 5 of 1995
  - Law No.5 of 1998
  - Law No 5 of 1999
  - Law No 5 of 2000
10. The land is...
- an area on the earth surface with specific characteristics based on existed phenomena
  - an area on the earth surface with specific characteristics based on climate, rock, soil, vegetation, landscape, land's use, fauna, and human existing on the surface
  - an area that experience decay process
  - an area that experiences erosion process and mass wasting process.
  - An area that experiences decay and erosion
11. Acid rain is rain which has high acidity and the pH value is...
- less than 4.6
  - less than 5.6
  - more than 4.6
  - more that 6.6
  - less than 6.6
12. (1) Governmental Rule No. 17 of 1999  
 (2) Governmental Rule No. 27 of 1999  
 (3) Governmental Rule No. 19 of 1999  
 (4) Governmental Rule No. 41 of 1999  
 The rules of environmental impact assessment (AMDAL) and air pollution control are...
- 1 and 2
  - 1 and 3
  - 2 and 3
  - 1 and 4
  - 2 and 4
13. The characteristics of the erosion and landslide prone area are...
- Steep slope hills, thick soil layer and high rainfall
  - Steep slope hills, thin soil layer and high rainfall
  - gradient slope hills, thick soil layer, and low rainfall
  - gradient slope hills, thin soil layer, and low rainfall
  - Steep sloped hills, thick soil layer, and low rainfall
14. Region with particular characteristic both in the land and the water functioning to protect the life buffer system is called...
- nature preserve area
  - sanctuary area
  - wildlife sanctuary area
  - natural preservation area

- e. national park area
15. (1) forest nature reserves area  
(2) forest park area  
(3) conservation forest area  
(4) natural tourism park area
- Areas that belong to the conservation forest are....
- a. 1 and 2  
b. 1 and 3  
c. 2 and 3  
d. 1 and 4  
e. 2 and 4

**B. Answer the questions below correctly and write your answer in your assignment book.**

1. Explain the definition of abiotic environment and abiotic environment. Give some examples.
2. What is environment quality?
3. Mention some efforts to anticipate ecological limitation.
4. Explain the benefits of the environment for the human beings. Give an example.
5. Explain the definition of conservation based on world conservation strategy manifested in the Law number 5 of 1990.
6. Mention two natural factors which can damage land productivity.
7. Explain and give examples of the environmental damage forms in Indonesia.
8. Mention the rules concerning environmental control and management.
9. Mention some areas that need conservation for life's sustainability.
10. Mention the classification of conservational area based on the Law number 5 of 1990.

## Final Examination

### A. Choose one best answer and write down your answers in your assignment book.

1. In the food pyramid, human is the consumer of level...  
a. I      c. III                  e. VI  
b. II     d. IV
2. Human, plant, and animal belong to....environment.  
a. social                  d. ecosystem  
b. abiotic                e. living  
c. biotic
3. The impact of greenhouse effect is...  
a. many industries that use glass  
b. many houses that use glass  
c. many buildings that use galas  
d. there are many of CO<sub>2</sub> producer  
e. there are many of O<sub>2</sub> producer
4. The followings are the characteristics of deciduous forest in temperate climate region, they are...  
a. the trees are parted, xerophytic, lose the leaves in the dry season, poor in lianas and epiphyte.  
b. the vegetation is not so dense, there are some trees that lose the leaves during the dry season  
c. the vegetation is not so dense, evergreen in winter, and some trees lose the leaves in summer  
d. high trees forming canopy  
e. Thorny trees
5. A group of homogeneous individuals that live in particular place is called...  
a. individual  
b. population  
c. habitat  
d. ecosystem  
e. environment
6. Human being, individually and socially, is involved in....environment.  
a. biophysical                  d. political  
b. social                        e. living  
c. cultural
7. The holistic and comprehensive unity arrangement among environment elements that interplay one into another is called  
a. individual  
b. population  
c. habitat  
d. ecosystem  
e. environment
8. Holarctic region, comprising all of North America, Mexico heights, and Greenland, belongs to....  
a. palaeartic  
b. nearctic  
c. oriental  
d. Australian  
e. Neotropical
9. The number of population per agriculture land width is called...  
a. agrarian population density  
b. rough population density  
c. physiological population density  
d. rational population density  
e. agrarian environment capacity
10. Cananga is the mascot of....  
a. Aceh  
b. North Sumatra  
c. West Sumatra  
d. Bengkulu  
e. Riau
11. Factors that damage the ecosystem balance continuously is....

- a. unplanned dispose of industrial waste
- b. earthquake
- c. volcano eruption
- d. long term dry season
- e. storm

12. Natural non renewable resource are as follow:

- a. sun, water, and mineral
- b. soil, air and water
- c. oil, coal and mineral
- d. agriculture, plantation and fishery
- e. water, coal and gas

13. Rice field which watering depends on rain water is called...

- a. non technical ricefield
- b. technical ricefield
- c. limited irrigation ricefield
- d. rainfed ricefield
- e. rain water ricefield

14. The cause of acid rain is...

- a. greenhouse effect
- b. motor vehicle smoke
- c. bare forest
- d. water pollution
- e. animal's dung

15. Area that does need conservation is...

- a. water diffusion zone
- b. erosion-prone zone
- c. landslide-prone zone
- d. reforestation-prone zone
- e. potential land

16. Nature preserves area which natural condition forms unique plants, animals and ecosystem is called...

- a. natural reservation
- b. sanctuary
- c. natural conservation
- d. national park
- e. forest park

17. Natural conservation area which is managed and used for science needs is called...

- a. natural preserves
- b. wildlife sanctuary
- c. natural conservation
- d. national park
- e. forest park

18. The government provides places to prevent animal extinction. The place is called...

- a. protection forest
- b. zoo
- c. hunting park
- d. wildlife sanctuary
- e. national park

19. Eco-efficiency is reflected from the following activity:

- a. using best seedling for agriculture
- b. minimizing waste in production
- c. utilizing toxic-free fertilizing technology
- d. using energy-saving machine
- e. modifying process and equipment to be more sophisticated

20. In the food pyramid of a ricefield, rat is level...consumer.

- a. I
- b. II
- c. III
- d. IV
- e. VI

21. Effort to reduce critical land can be done by...

- a. terracing
- b. preventing the extension of critical land
- c. stopping the exploitation of resources of the land

- d. hindering the flow of river water
- e. building a dam

22. Borneo's land is relatively less fertile comparing to Java's land. It is because...

- a. most of the land is organic
- b. rainfall is lesser
- c. there are many rivers
- d. there are many covered land areas
- e. it mostly has steep morphology

23. Land degradation is...

- a. the rise of land surface
- b. the decrease of land surface
- c. the decrease of land quality
- d. the rise of land quality
- e. the decrease of water quality

24. Aggradation is...

- a. the rise of land surface
- b. the decrease of land surface
- c. the decrease of land quality
- d. the rise of land quality
- e. the decrease of water quality

25. Factors influencing population growth is...

- a. natality, mortality, emigration
- b. natality, mortality and immigration
- c. natality, immigration, emigration
- d. natality, mortality, migration
- e. natality, immigration, emigration

26. A bacterium is a...

- a. consumer
- b. producer
- c. decomposer
- d. food producer
- e. food maker

27. All conditions, both material and thing, as well as non material resulted by human activities is called...

- a. natural environment
- b. abiotic environment

- c. biotic environment
- d. social environment
- e. cultural environment

28. Weber line which moves middle and east part of Indonesia can be signed by the following animal:

- a. Elephant
- b. paradise bird
- c. *babirusa*
- d. squirrel
- e. deer

29. Ujungkulon as a wildlife sanctuary area protecting rhinoceros and bull is located in...

- a. East Java
- b. Madura
- c. West Java
- d. Surabaya
- e. Jakarta

30. Tapir is one of protected animals which occurs in...island.

- a. Komodo
- b. Celebes
- c. Borneo
- d. Sumatra
- e. Java

31. Paradise bird is a name of a bird chosen as the identity of Papua. The habitat of this bird is...

- a. inland forest
- b. swamp forest
- c. height forest
- d. lowland forest near seashore
- e. Digul river upper course

32. Reptile types occurring in Middle Indonesia Fauna region is...

- a. crocodile
- b. turtle
- c. snake
- d. komodo
- e. lizard

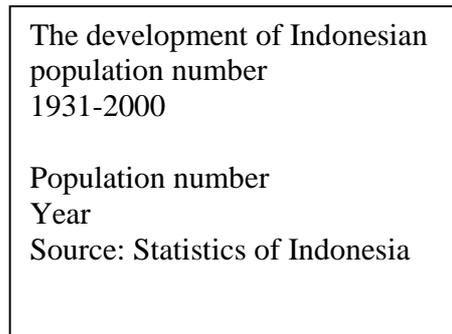
33. Black orchid is a flora that becomes the mascot of...

- a. Jakarta
- b. East Kalimantan
- c. Papua
- d. South East Celebes
- e. South Sumatra

34. The change of population number caused by natality, mortality and migration is called...

- a. demographic transition
- b. population growth
- c. population dynamics
- d. population composition change
- e. population development

35. Look at the graph below:



The form of the graph above is...

- a. bar
- b. circle
- c. triangle
- d. line
- e. bar

36. The feature eastern Indonesia fauna is of...type.

- a. Weber
- b. Wallacea
- c. Australian
- d. Asiatic
- e. Transition

37. The following does not belong to temperate climate biome:

- a. coniferous forest
- b. temperate rainforest
- c. Hard leaves forest
- d. Stiff leaves forest
- e. Mangrove

38. Along north seashore of java island the coastal land is used for...

- a. animal husbandry
- b. agriculture
- c. ponds
- d. industrial area
- e. mining

39. the most suitable coal mining system in Sumatra is open mining because...

- a. it is low cost
- b. the layer is stable
- c. the age of the layer is still young
- d. it does not need sophisticated skills
- e. the layer is near the earth's surface

40. In Indonesia, gold mining is located in...

- a. Cikotok
- b. Muntok
- c. Pomala
- d. Tembaga Pura
- e. Kampar

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## Glossaries

**Abiotic** 2, 46, 61 : non living things in the biosphere layer.

**Anthroposphere** 23 : One of geographic object of studies concerning the roles of population as earth's dwellers toward other elements in the earth.

**Energy current** 74 : The move of energy within a food chain starting from the producer to the consumers up to the decomposers.

**Biome** 9 : Land ecosystem that has large landscape and specific characteristics.

**Biotic** 2, 11, 61, 71, 72 : Living things, whether micro or macro, and their process.

**Biotope** 2 : Spatial unit that shows uniformity of its habitat condition.

**Carrying capacity** 75 : The natural ability of the environment to continue the life and the growth.

### **Demographic dynamics**

23, 27 : Interrelated Events that occur continuously concerning the change of population number.

**Ecosystem** 2, 17, 18,

61, 63, 72, 74, 76, 79,

81, 83 : 1.Organic community that consists of plants and animals together with their habitat.

2. Diversity of community and their environment which function as one ecological unity in nature.

3. Living arrangement amongst organisms and their environment in an area.

**Energy** 47, 54 : Ability to work

**Eco-efficiency** 63 : Economical and ecological efficiency resulted from the use of resources.

**Genetic erosion** 18 : The decrease of genetic diversity because of the extinction of genetic diversity of particular variety of animal or plant.

**Fauna** 2, 8, 9, 10, 11,

17, 18 : Animal's world in particular area or particular period.

**Flora** 2, 10, 11, 17, 18 : Plant's world in a particular place or particular period.

**Wallace line** 15 : A line created by Wallace (a biologist) starting from east Philippine passing through Makassar strait and between Bali and Lombok, separating Indonesia's fauna into eastern and western types.

**Weber line** 17 : A line create by Marx Weber ( a zoologist) dividing Indonesia into two regions namely west and east.

### **Bar chart**

**(bar graph)** 36 : a graph which data is represented by square, horizontally or vertically, like a histogram.

### **Line chart**

**(line graph)** 36 : A graph which data is represented by a line or dot.

### **Pie chart**

**(pie graph)** 35 : A circular graph which centre is divided into several parts to show how the total amount is divided up based on the percentage

**Habitat** 2, 18 : A special living place of particular organism.

**Homeostatic** 75 : A static condition in which plants and animals do not extinct and continuously alive.

**Acid rain** 78, 81 : The rain with high degree of acidity which pH value is less than 5.6

**Demographic information**

23, 33, 35 : An information of population number that can be displayed using map, table, and graph.

**Community** 2, 72 : Organism group that lives and interacts each other within a particular area

**Population composition**

23, 24, 26, 28 : The description of population condition in an area based on specific criteria. The criteria are based on, for example, geographic, biological and social conditions.

**Conservation** 71, 77, 79,

80, 81, 83 : A continuous biosphere management to gain benefits for today's and future's generations.

**Environmental quality**

61, 73, 77 : Environmental condition in relation with the quality of life.

**Living Environment**

71, 72, 74, 75, 78, 79 : The unity of space with all things, power, condition and living organisms including human beings and their behaviour that influence human's life and prosperity and other living organisms.

**Organism** 2, 47, 72, 74 : Any kinds of living things that live in water or land.

**Population** 2, 72, 75 : A group of the same kind organism.

**Population growth** 27, 28, 30 : The change of population number whether a reduce or a rise.

**Population pyramid**

23, 26 : A graph describing civilian's structure based on gender and sex.

**De jure Census** 33 : Census done to the civilians who really stay in a particular place as stated in the residence identification card or other certificate.

**De facto census** 33 : Census done to everyone met by the census officer in a region although the person does not stay there.

**Population census** 23,

33, 34, 35, 37 : Activities of collecting, managing, and publicizing demographic data in a country of a particular period.

**Resource** 61, 63 : The result of human's assessment to the elements of living environment needed.

**Natural resource** 45,

46, 47, 53, 61 : Environment condition and raw materials used by people to fulfil their needs and to improve their prosperity.

**Tundra** 7, 10 : A land without any tree which vegetation is dominated by moss and lichen.

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This Geography textbook is arranged interestingly and easily to enable students to understand facts and environmental concepts around them. Learning Geography means understanding physical processes that form patterns of the earth surface, characteristics, and the spread of spatial ecology on the earth surface. So the students will be able to understand than human being creates region to simplify complexity of the earth surface. This is important because Geography is useful for facing environmental phenomena which become more threatened and more economically competitive.

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