

# CHAPTER 10.1 – THREATS TO THE ENVIRONMENT

## Definition of environmental sustainability

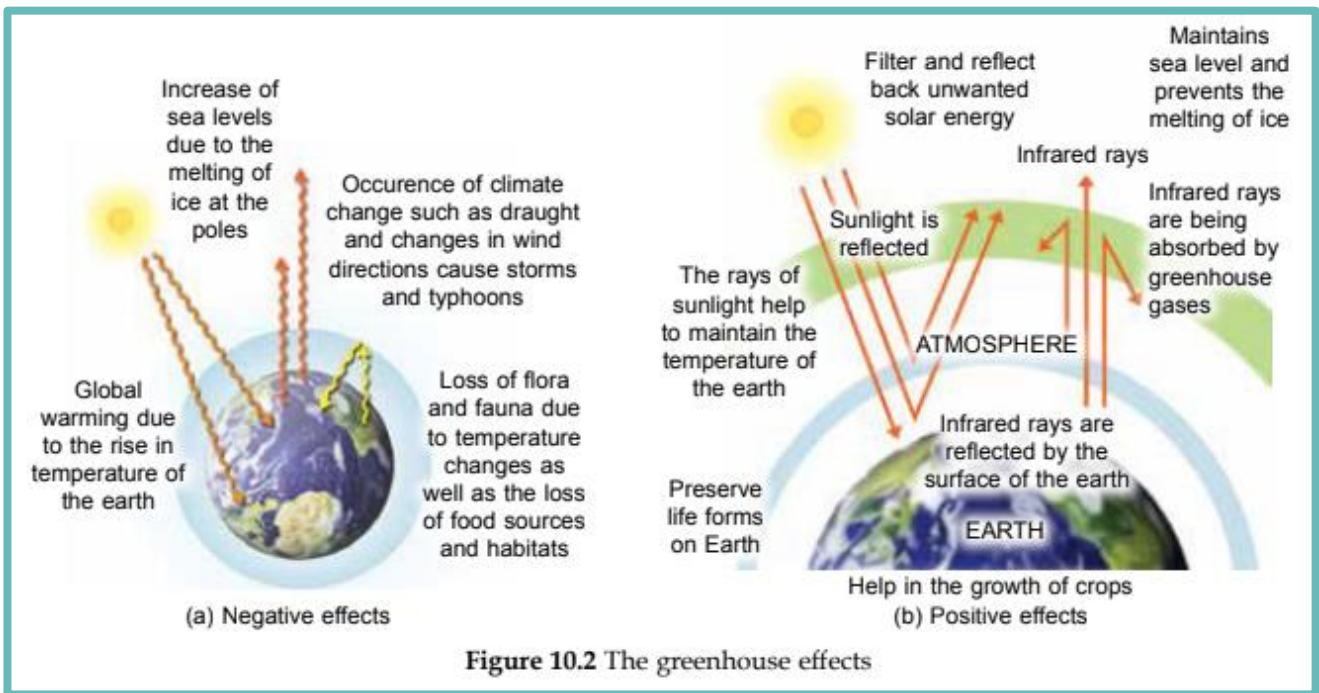
- Δ Environmental sustainability means an environmental condition that remains the same without any reduction or depletion of natural resources, with an assured quality of the surrounding environment, for a long period time
- Δ Environmental sustainability ensures the demands of current needs are met without affecting the needs of future generations
- Δ The good quality of the environment will be disturbed when its sustainability is neglected
- Δ The increase in human population has caused a conflict between the need to meet the demands of human beings and the need to conserve the environment
- Δ Using recycle bins is one of the strategies to sustain the environment which can reduce the usage of non-renewable sources

## Threats to the environment

- ✚ Threats to the environment are caused by human activities in the ecosystem

## Climate change and global warming

- A climate change refers to the change in temperature of the earth, rainfall distribution and drastic changes of the winds
- When sunlight enters the atmosphere of the earth, some of the light is reflected back into the space in the form of infrared rays
- When heat energy is released, most of the energy will be absorbed by the greenhouse gases (carbon dioxide, methane, nitrogen oxide and chlorofluorocarbon) which exist in the atmosphere of the earth, thus preventing the infrared rays from being reflected back into space
- Heat energy that is not reflected keeps the earth at average temperature so it is not too cold for the survival of organisms
- Gases (carbon dioxide) are naturally formed but human activities have caused the increase in concentration of these gases
- Thus, more heat energy is trapped which consequently increases the temperature of the earth
- This condition is known as the greenhouse effect



**FACTORS CAUSING GREENHOUSE EFFECT AND GREENHOUSE GASES**

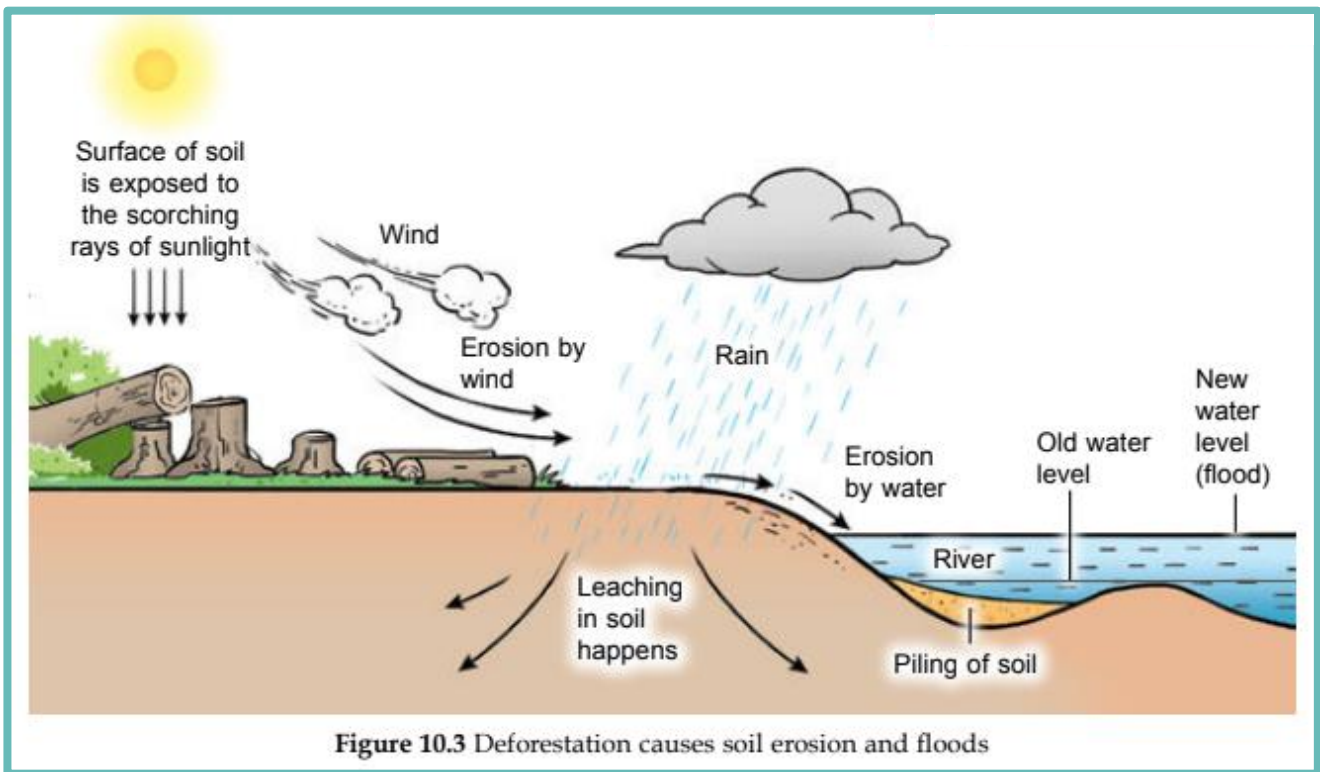
| FACTORS CAUSING GREENHOUSE EFFECT             | GREENHOUSE GASES INVOLVED   |
|---|---|
| Burning of fossils fuels                      | Carbon dioxide (CO <sub>2</sub> ) and nitrogen dioxide (NO <sub>2</sub> ) |
| Deforestation                                 | Carbon dioxide (CO <sub>2</sub> )   |
| Animal farming                                | Methane (CH <sub>4</sub> )  |
| Agricultural activities (nitrogen fertiliser) | Nitrogen oxide (NO)   |
| Usage of cooling substances                   | Chlorofluorocarbon (CFC)  |

**THE EFFECTS OF CLIMATE CHANGE**

- El Nino phenomenon causes extreme hot and dry weather which results in draught
- La Nina phenomenon causes unusual heavy rain which results in a serious flood

*Deforestation and loss of biodiversity*

- Deforestation is the action of clearing a wide area of trees in a large scale
- It is the main cause for the loss of biodiversity
- Loss of habitats due to deforestation for construction and agricultural activities has caused the extinction of many species of flora and fauna
- Global changes caused by pollution are contributing to the loss of biodiversity
- In addition, illegal hunting of wildlife for the purpose of food, medical and handicraft industries have subsequently reduced animal populations, driving certain species to extinction
- Furthermore, acid rain causes the pH of water to become low, a condition in which a great number of fish eggs cannot hatch and some adult fish die



**THE PURPOSE OF DEFORESTATION**

**ACTIVITIES**

- ❖ To obtain timber for construction work, furniture and paper
- ❖ Mineral mining
- ❖ Opening new areas to carry out agricultural activities
- ❖ Building residential areas and roads

**NEGATIVE IMPACTS OF DEFORESTATION**

**ACTIVITIES**

- ◇ Soil erosion
- ◇ Flash flood
- ◇ Climate change
- ◇ Loss of biodiversity
- ◇ Disruption of nitrogen cycle, water cycle and carbon cycle
- ◇ Loss of water catchment areas

*Eutrophication*

- Eutrophication is a process that occurs when the water ecosystem becomes rich with nutrients, resulting in changes to the structure of the ecosystem
- Excessive usage of nitrate and phosphate fertilisers in agricultural activities and others factor can also cause eutrophication

**THE EFFECTS OF EUTROPHICATION**

- ✓ Algal blooms
- ✓ Death of aquatic life
- ✓ Deterioration of water quality

**EUTROPHICATION PROCESS**

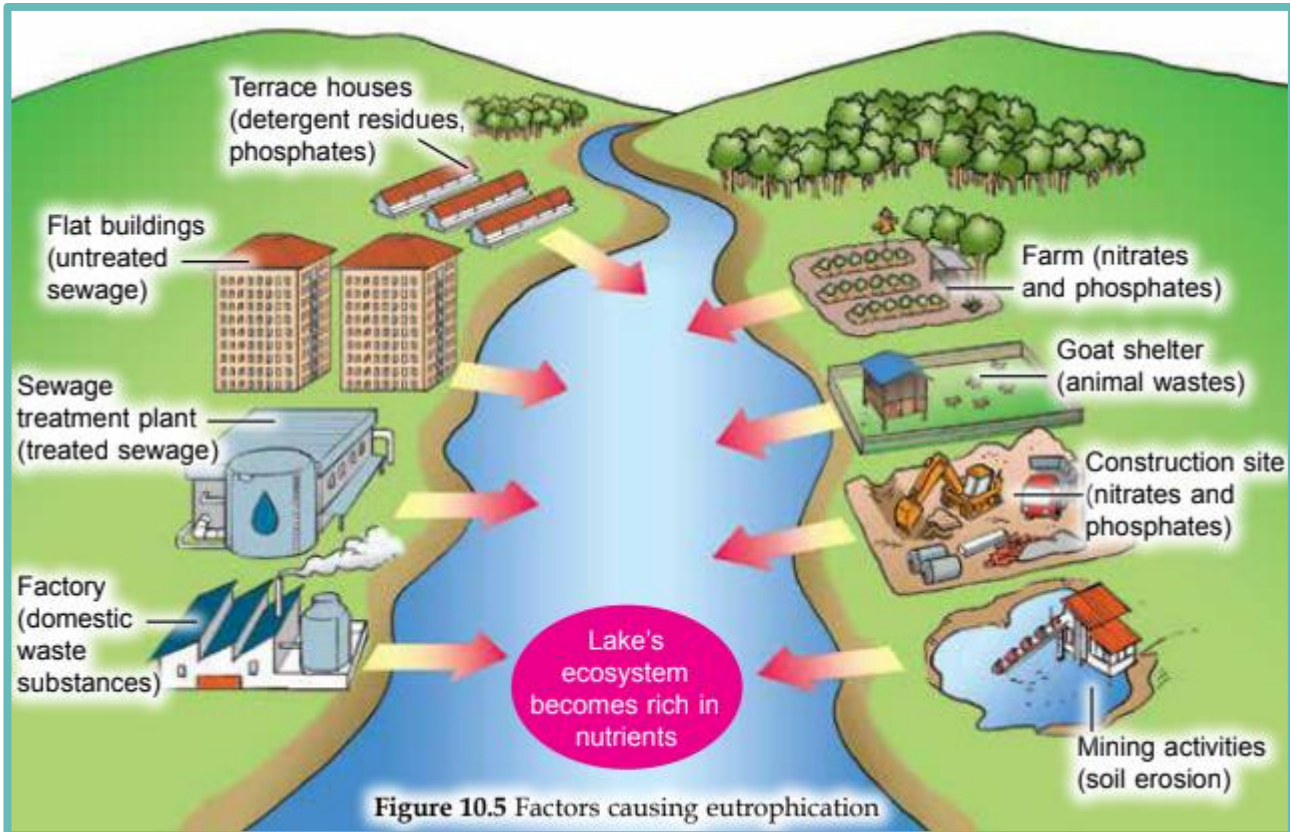
- ⊞ Excess nitrate and phosphate residuals flow into lakes and rivers with the help of rain water
- ⊞ The increase in nitrate and phosphate stimulates the rapid

growth of algae, covering up the water surface

- ⊞ This condition is known as **eutrophication**
- ⊞ This situation **reduces** the penetration of sunlight into the water
- ⊞ The rate of photosynthesis of aquatic plants **slows down** and the

content of dissolved oxygen in the water **decreases**

- ⊞ This causes aquatic plants and animals to **die**
- ⊞ The abundance of algae and the death of aquatic organisms also cause a **rise** in the population of decomposer bacteria



**BIOCHEMICAL OXYGEN DEMAND (BOD)**

- ♥ Biochemical oxygen demand (BOD) is the total amount of oxygen needed by microorganisms (bacteria and fungi) to **decompose organic materials** in water
- ♥ A **high BOD level** indicates **low quality of water source**, as there are many organic substances and decomposed microorganisms in the water

- ♥ A **low BOD level** means the water is of **good quality** as it is **unpolluted** and **dissolved oxygen content** is high

*Pollution*

**AIR POLLUTION**

- ⊕ **Air pollution** happens when there is an **increase in the pollutant substances** (gases, smoke, dust and particles) in the atmosphere which **affect health and lives of human beings, animals and plants**

- ⊕ These pollutants **increase** when there is a **rise of smog** and **gases released** by vehicles as well as industrial factories and also from open burning
- ⊕ The sources of air pollution
  - 1) Exhaust fumes from vehicles
  - 2) Smoke from industrial factories
  - 3) Open burning

### Exhaust fumes from vehicles

Pollutant substances:

- ↳ Nitrogen oxide
- ↳ Carbon monoxide
- ↳ Lead
- ↳ Smoke and soot (small particles of carbon)
- ↳ Hydrocarbon gases (e.g., benzene)

### Smoke from industrial factories

Pollutant substances:

- » Sulphur dioxide
- » Nitrogen dioxide
- » Dust
- » Carbon monoxide
- » Carbon dioxide

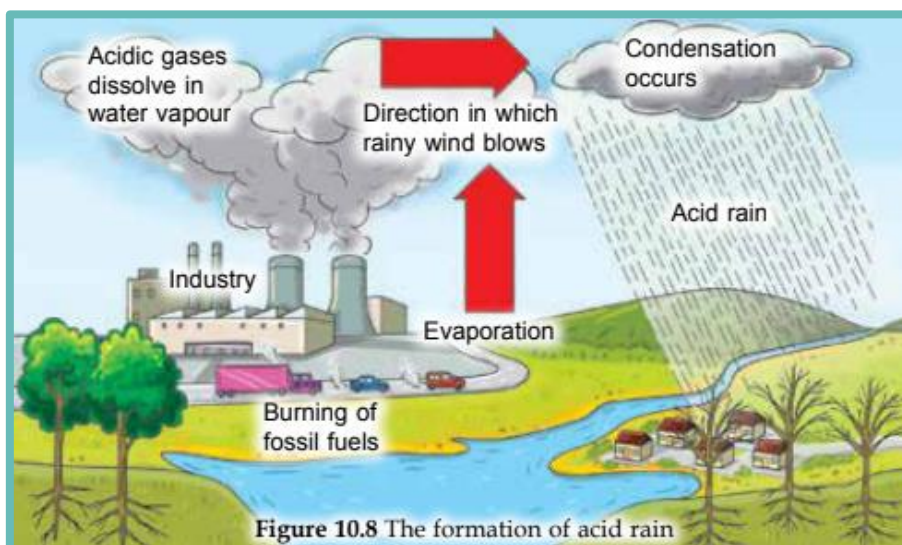
### Open burning

Pollutant substances:

- Carbon dioxide
- Smoke and soot

### The formation of acid rain

- ❑ The **burning of fossil fuels** by charcoal burning plants, industrial factories and vehicles **releases carbon monoxide, nitrogen oxide and sulphur dioxide** into the atmosphere
- ❑ These gases **combine with water vapour** in the atmosphere to **form nitric acid and sulphuric acid**, and later come as **acid rain**
- ❑ Acid rain causes **the soil to become infertile** due to the pH value less than 5
- ❑ Acid rain also **destroys leaf tissues and damages the root of plants**
- ❑ In addition, an increase in water acidity **reduces plankton population** which is the food source for fish
- ❑ This affects the food chain and can cause the death of various organisms
- ❑ Acid rain also causes **skin diseases and tissue damage in humans**



## THERMAL POLLUTION

- ✚ Thermal pollution refers to the deterioration of water quality due to excessive heat dissipation into water caused by processes that change the water temperature
- ✚ Water is used as a cooling agent to cool down generators in industrial factories and hydroelectric power generator plants
- ✚ The hot water produced is then discharged into rivers or lakes causing thermal pollution
- ✚ The increased temperature of the river water is unsuitable for aquatic habitats
- ✚ As the temperature of water rises, the dissolved oxygen content in the water will decrease and threaten the survival of aquatic lives
- ✚ Thermal pollution endangers the lives of aquatic organisms and is also hazardous to the environment
- ✚ The rise in water temperature disrupts biochemical processes of aquatic organisms as fish and other aquatic animals normally live in a range of certain temperature
- ✚ For example, the increase of water temperature can cause early hatchery of fish eggs or worse, they fail to hatch
- ✚ For certain species, a drastic increase of water temperature can cause instant death
- ✚ Furthermore, for organisms (algae), higher temperature enhances their growth and consequently, raises the BOD level

## NOISE POLLUTION

- ◇ Noise pollution can be defined as sounds that disturb and cause detrimental effects to the health of humans and animals
- ◇ Examples of noise pollution:
  - I. The sound of vehicles
  - II. Construction activities
  - III. Agricultural and industrial machineries
  - IV. Loud music in event gatherings
- ◇ Exposure to high level of noise for a prolonged period of time can also cause health problems
- ◇ For instance:
  1. High blood pressure
  2. Depression
  3. Headache

## Human population growth explosion

- Population growth explosion is the increase in total number of humans living in a certain area
- As a result of the rapid population growth, there is an equally rapid reduction of natural resources, which leads to deforestation, loss of biodiversity and global warming
- Forests are cleared to provide shelters, infrastructures, agricultural lands and various facilities for the increasing population
- Hence, living organisms are exposed to threats such as problems in having raw water sources and supply of

- clean water, increase of pollution and diseases, and the extinction of various organisms among others
- The demand on water and sources available in the local community are not well-managed with the existing natural resources in the area
- This has resulted in transporting the sources from another location to the demand zones
- Furthermore, sewage also contaminates land areas, a threat to pollute the environment
- In order to overcome these problems, water treatment technology is used although there is an increase in the cost of water sources as well as the cost of treated water

# CHAPTER 10.2 – PRESERVATION, CONSERVATION AND RESTORATION OF ECOSYSTEM

## Necessity in the preservation, conservation and restoration of an ecosystem

### ECOSYSTEM PRESERVATION

- Preservation of an ecosystem can be defined as **the efforts made to protect** the components of an ecosystem so it will **remain in its natural condition**
- One of the ways towards preserving an ecosystem is by **gazetting forests as reserved areas** to protect the natural beauty of flora and fauna
  - a) Reserved forests are protected from any development activities
  - b) 90% in the upper part of Belum Forest Reserve is still unexplored and has yet to become research sites

### ECOSYSTEM CONSERVATION

- ❖ Conservation of an ecosystem means **the efforts to restore environmental resources** such as water, forests, energy, air, minerals, among others so they will **continue to exist**
- ❖ Conservation strategies are carried out in order to save the components of an endangered ecosystem
- ❖ There are **two strategies** of conservation, which are **in situ** and **ex situ**
  - i) *In situ* conservation retains **wildlife species in their original habitat** such as natural parks and marine parks
  - ii) *Ex situ* conservation keeps **wildlife species outside of their original habitat** such as in zoos and botanical parks

### ECOSYSTEM RESTORATION

- Δ Restoration of an ecosystem means **efforts for renewing and restoring natural** ecosystems that have **deteriorated, damaged or destroyed** due to human activities
- Δ Reforestation and planting of cover crops are steps of restoration being taken to **ensure the continuity of natural resources** for future generations

# CHAPTER 10.3 – PRACTICES IN ENVIRONMENTAL SUSTAINABILITY

## Practices that contribute towards environmental sustainability

### ENVIRONMENT-FRIENDLY TRANSPORT

- ⊞ Use environment-friendly transport such as bicycles or hybrid and electric vehicles
- ⊞ Practise carpooling
- ⊞ Use public transport such as buses, commuters, monorails, Light Railway Transit (LRT), Electric Train Service and KLIA Express/KLIA Transit

### 5R'S CONCEPT

- ♥ The disposal of waste materials can be reduced when we practise 5R's:
  - i. Rethink
  - ii. Repair
  - iii. Reuse
  - iv. Reduce
  - v. Recycle

### THE USAGE OF ALTERNATIVE RENEWABLE ENERGY

- ✓ Renewable energy means energy that is generated from natural resources such as the sun, wind, waves, water, geothermal and biomass
- ✓ Renewable energy is cleaner, easier and safer

### WATER SAVING

- Collect rain water or reuse water to water plants and wash vehicles

### BIOLOGICAL CONTROL

- » Biological control is a way to control the population of pests using their natural enemies
- » It is a way to reduce the usage of pesticides

### MANAGEMENT OF DOMESTIC AND TOXIC WASTE

- ↳ The Department of Environment has been given the authority to:
  - a. Coordinate waste disposal activities
  - b. Set the maximum limit of waste production
  - c. Control licenses for categories, content, quantity and risks of waste products
- ↳ Upcycling waste substances can reduce waste to be taken to landfill sites

## The status of food security in Malaysia

- ⊕ Food security is defined as having an assurance on the availability of food, as well as sufficient access to food and safe food utilisation

## THE COMPONENTS OF FOOD SECURITY

- ❑ Availability of food
  - There is sufficient supply of high-quality food in the local market as well as for imported food
- ❑ Access of food
  - Food can be obtained easily in order to meet the nutritional needs of diet
- ❑ Food utilisation
  - The ability of an individual to get enough nutrients by consuming food and drinking clean water as well as good practices in food processing and preparation
- ❑ Food stability
  - Each individual has access to get enough nutritious food at all times

## HALAL

- ✚ Halal is an important element in determining the status of food security
- ✚ Halal food must be manufactured in clean surroundings using methods which emphasise on hygiene and orderliness during the production process
- ✚ Halal means an inclusive in all aspects, beginning from the farm to the final food product
- ✚ Other guidelines which are implemented in order to determine food security are Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Points (HACCP)
- ✚ Just like the halal factor, the two guidelines also emphasise on the quality of processes that are hygienic, healthy and safe during food preparation

## CHAPTER 10.4 – GREEN TECHNOLOGY

### Definition of green technology

- ◇ Green technology refers to the development and application of products, equipment and system to preserve the environment and nature while minimising or reducing the negative impacts of human activities

### The use of green technology in environmental

- Green technology had been a portfolio of the Ministry of Science, Technology and Innovation (MOSTI) which was established on 27th March 2004, accounting for the long-term and short-term effects of human activities on the environment
- National Green Technology Policy (2009) states that any product, equipment or system that fulfilled the criteria can be categorised as green technology
- National Green Technology Policy (NGTP), launched in July 2009 gives emphasis on the growth of economy and sustainable development of the country
- Sustainable development must fulfil the needs of current society without

abandoning the needs of future generations

- NGTP is based on four pillars, which are energy, environment, economy and social

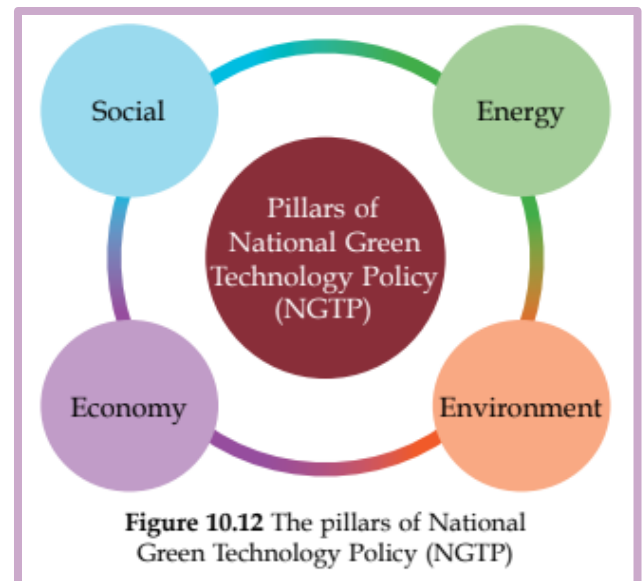


Figure 10.12 The pillars of National Green Technology Policy (NGTP)

### CRITERIA REQUIREMENT FOR GREEN TECHNOLOGY PRODUCT, EQUIPMENT OR SYSTEM

- Can minimise environmental degradation
- Has low or zero release of greenhouse gases
- Safe to use as well as promote healthier and better surroundings for all living things
- Efficient use of energy and natural resources
- Encourage the usage of renewable resources

## Innovation in Malaysia

- Green building is a building concept which has the characteristics of nature-friendly technology
- The main purpose of the concept is efficient use of natural resources such as energy, water and materials
- Examples:
  - A. The Perdana Putra building, Putrajaya
  - B. Cyberjaya Community Recycling and Collection Centre

### NATURAL RESOURCES AND ITS USES

- Social energy
  - Solar panels convert solar energy into electrical energy for lighting inside the buildings
- Water
  - Water catchment systems collect rain water that can be used for plants watering and cleaning of toilets
- Building materials
  - Encourage the usage of recycled materials

### THE ADVANTAGES OF A GREEN BUILDING

- Δ Reduces negative effects towards human health due to development
- Δ Reduces negative effects towards the environment due to construction activities
- Δ Saves the cost of operation, maintenance and construction

## Practices using the concept of green technology

- ⊞ Producing eco-enzymes from fruit waste into cleaning agents
- ⊞ Recycling kitchen waste and food waste to produce natural fertiliser or growth booster for crops
- ⊞ Producing biogas from organic solid waste
- ⊞ Using banana peels to make flour which can be used as an ingredient to produce natural bioplastic
- ⊞ Producing liquid foliar fertiliser from kitchen waste to be used on leaves as a growth booster for vegetables

## Application of social science to solve environmental problems and challenges

- ❖ Social science makes use of scientific methods to investigate the field of humanity
- ❖ One of the branches in the field of social science is education
- ❖ In the Third Malaysia Plan, emphasis on environmental education has been introduced into the Malaysian education system
- ❖ Environmental education aims in creating an awareness among the population into being responsible towards environment and environmental issues

- ❖ Communication is also one of the aspects in social science which plays important roles in solving environmental problems and challenges using mass media, pamphlets, magazines, posters and films
- ❖ Various activities can be implemented to rouse the interest of people in taking care of the environment
- ❖ For example, promoting awareness campaigns to discourage tree-cuttings as well as to preserve water and soil resources
- ❖ Other activities include coordinating a large-scale gotong-royong in residential areas, schools, recreation parks or beaches, and organising competitions for cleanliness and beautification of schools and house compounds

## THE OBJECTIVES OF ENVIRONMENTAL EDUCATION

- » Increasing the awareness of individuals and society towards environmental conditions and its problems
- » Providing knowledge to individuals and society about environment, problems and the role and responsibility of each individual
- » Gaining skills in solving environmental problems
- » Taking care of the environment and willing to protect and develop the environment

