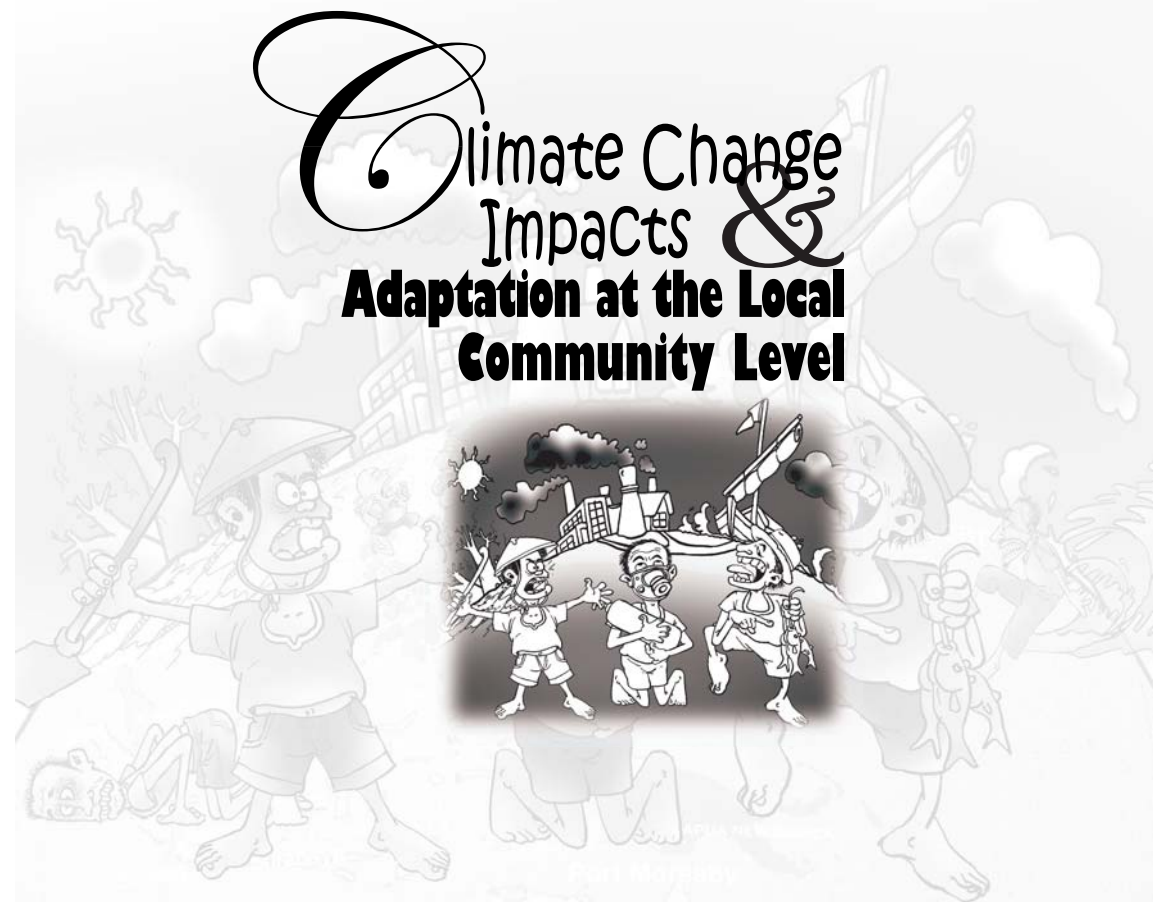




Climate Change Impacts & Adaptation at the Local Community Level



Climate Change Impacts & **Adaptation at the Local Community Level**



INTRODUCTION

There is no doubt that climate change in the world has been caused by human activities, such as the over-consumption of fossil fuels through the use of vehicles, electricity, plastics, etc. Even now, global forests are being destroyed and the amount and

scale of extreme weather and natural disasters are increasing. The global poor are increasingly suffering because most of their livelihoods depend on natural resources, which are affected directly by climate change. Without any information, technologies or financial resources, they can do nothing but suffer the damages of climate change. We are faced with a most serious crisis and must find a compromise to achieve a sustainable world. We should accept this fact now and find suitable solutions with the cooperation of the entire community.

This booklet introduces what happens as a result of climate change and what we should do for climate change at the community level. There are various impacts of climate change and different circumstances, but this booklet may show some ways on how to start tackling the problem in your own community.





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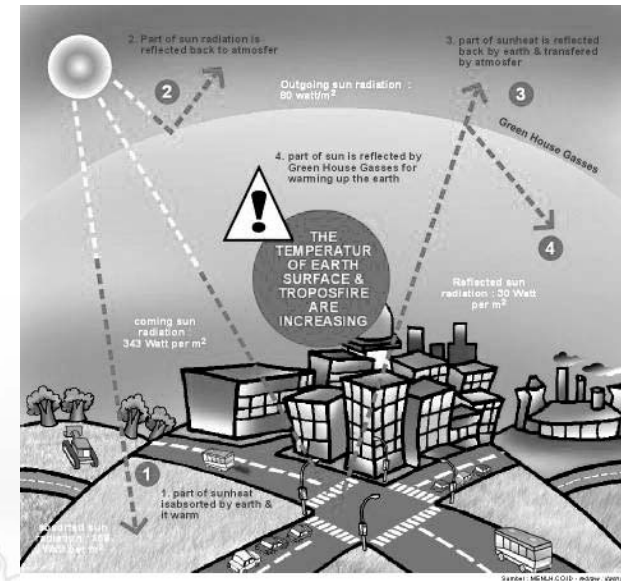
V. REFERENCES

I. WHAT IS CLIMATE CHANGE?

1. GLOBAL WARMING AND CLIMATE CHANGE



Greenhouse effect



In the natural world, greenhouse gases, such as carbon dioxide (CO₂) and methane, are important to keep the Earth warm. When the sunlight enters the Earth's atmosphere, it reaches the surface and some energy is reflected back into space, but much of it remains trapped by greenhouse gases that form a blanket around the Earth. This is called "The Greenhouse Effect".

However, an excess of greenhouse gases causes unusual warming, global warming. This is a result of over-consumption of fossil fuels, such as oil, coal, and natural gases, which are made from the remains of ancient plants and animals, and the use of land changed by humans. This causes climate change, which is a serious crisis for ecosystems, our livelihood, and our survival.

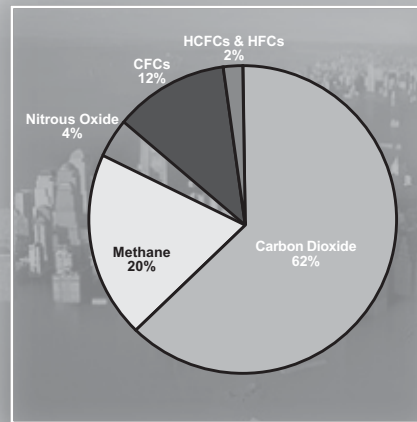


Carbon dioxide is a major component of greenhouse gases, making up 60%. It is produced by the human activities of fossil fuel burning and deforestation. The burning of fossil fuels used in industry, transportation and generating electricity produces a large amount of carbon dioxide emissions.

The increase of the level of greenhouse gases in the atmosphere in last 100 years has made the temperature of the earth rise. The global temperature rise during last 100 years is 0.74°C. This change has occurred worldwide. " All parts of the world have experienced this temperature rise and it is expected that the global average temperature will rise by as much as 6.4°C this century with current economic growth".

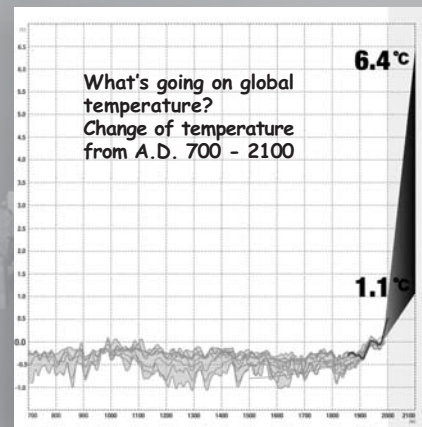
As the temperature rises due to global warming, the climate will be influenced. Wind and ocean flow systems and hydrology cycles will change. The warmer atmosphere will trigger more water vapor, causing an unstable climate.

(Source: IPCC Fourth Assessment Report)



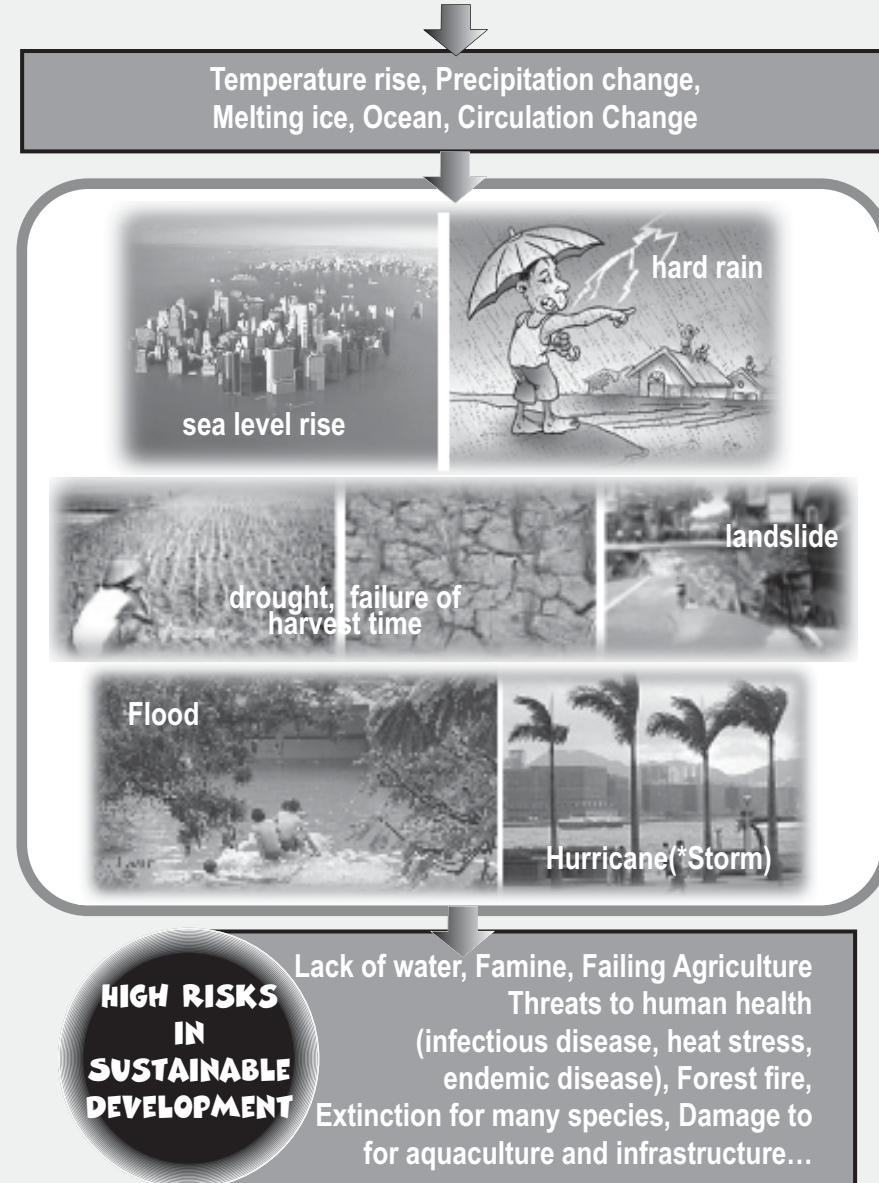
percentage of the greenhouse gases

global temperature



2. IMPACT OF CLIMATE CHANGE

Green House Effect



Environmental destruction and global warming have caused many problems for us. The beginning of the rainy season in some areas is often delayed later than usual. Meanwhile, in other areas, rain comes earlier. Thus, rain which usually lasts for a short time with and falls without strong wind, is getting falling harder and lasting longer. It's getting worse with the destruction of forest and environment. The rainfall can not be absorbed by the roots of trees. As a result, floods and landslides happen more frequently and the impact is getting bigger. Meanwhile, in the dry season, it is getting difficult to get water as rivers often dry up. Even if there is water, there is not enough and rainfall is rare. These symptoms show that the climate has changed.

If air pollution caused by fuel burning, decomposition of organic garbage in agriculture and animal husbandry, and deforestation and forest burning can not be stopped, it is possible that extreme whether, long droughts, strong wind, and high temperatures in the dry season will happen more and more frequently.

(Rizaldi Boer /Head of Climatology Laboratory, Geomet Department, FMIPA, IPB)

II. IMPACTS ON THE LOCAL COMMUNITY

(CASES FROM THE INVESTIGATION IN YOGYAKARTA AND SEMARANG CITY IN INDONESIA BY BINTARI FOUNDATION, WALHI YOGYAKARTA AND FOE JAPAN IN 2007)

1. IMPACTS ON LIFE

The change of temperature globally impacts various sectors of life. People in local communities can feel the impacts of climate change in last couple of years

- The temperature rise: The rise in temperature was 0.2 °C from 1986 to 2006. *(in Semarang)*
- The abnormality of rainfall: The amount of rainfall has greatly increases. Sometimes in the rainy season, rain falls with great intensity. *(in Semarang)*
- The rate of natural disasters: Droughts and storms, which increase the risk of landslide, are increasing in some areas. *(in Yogyakarta)*.
- The change of seasonal systems: The rainy season is starting earlier and ending sooner. *(in Semarang and Yogyakarta)*



- The increase of diseases: Some sources of diseases like blood fever and dengue spread easily, since mosquitoes carry those diseases more quickly as the temperature rises. 288 cases of blood fever occurred in 2007. *(in Semarang)*



2. IMPACT ON AGRICULTURE

In the agricultural sector, the impact of climate change really influences the farmers.



- The decrease of land for agricultural production: The decrease of land is caused by the changing the function of land for farming.
- The reduction of agricultural production due to harvest failures caused by drought and flood: Such conditions are caused by changing seasonal systems. The normal cultivation cycle cannot be used for planning and harvesting in unpredictable periods. Flood and drought cause harvest failures and farmers can harvest only twice a year where conditions were not the same few years ago, when farmers could harvest three times a year.
- Harvest failure in the agricultural sector: Irregular agricultural production makes the farmers unable to provide enough food for their family.
- The lack of clean water supply: The water supply also triggers conflicts in the local community. Fights occur over water to irrigate rice fields and other agricultural field. The lack of water can also cause malnutrition in farmers' cattle. Since the cattle are not in the appropriate condition to be sold, the selling value decreases and the farmers' income from cattle production decreases as well. With such conditions, taking the initiative to buy clean water from private companies is most likely. However, since their income has decreased, this just makes the farmers' burden in Yogyakarta heavier.





The increase in the number of infectious disease among farmers indicates that the living condition of the farmer's family has worsened. Farmers do not have enough income or ability to support minimum standard of health service for their family. Uncertain economic conditions due to harvest failure make it difficult for farmers to meet the nutritional needs of their family. These social conditions are actually influenced by events happening due to temperature change.

3. IMPACT ON FISHERIES

The fisheries sector is greatly impacted by climate change

- The decrease of fishpond area to 10 ha in 3 years. The fishpond fishermen have experienced a decrease in fish production and are not receiving their normal income. Their quality of health and life has decreased as well, since their income cannot cover their basic living costs, like food, clothing, and housing. They lose hundreds and even thousands of fish eggs which have been cultivated in the fishpond. The reduction of fishpond product results in the decrease of fishpond fishermen income by 30%.
- Big storms occur with hard rain in the ocean. Large waves assault the edge of coast and are not reduced by wave breakers or mangrove trees. Water waves come up to the shore and overwhelm the fishponds on the coastline. Houses near the coast are also battered by the waves. The communities



near the coast then have to move, as they have no place to live.

- The sea water that comes up to the land overwhelms the fishpond. Many fish in the fishpond disappear and escape to the sea by ebb tide.
- Farmers working in nearby fishing villages have to change jobs to fishpond fishermen, because sea water that floods their rice fields makes it impossible to plant there anymore.

III. COMMUNITY BASED ADAPTATION TO CLIMATE CHANGE

1. ADAPTATION STRATEGY AND PLANNING

The impact of climate change can be felt in local communities, where it's a challenge just to survive. Because they are continually facing the direct impacts of climate change, the



development of comprehensive strategies has to be available to the communities most affected.

(Rizaldi Boer /Head of Climatology Laboratory, Geomet Department, FMIPA, IPB)

ADAPTATION MEASURES TO CLIMATE CHANGE



Vulnerable sector	Adapataion to current impacts	Adapataion to future impacts
Water resources	Protection of ground water resources, water catchments areas Improvement water supply	Use recycle water Improved system of water management
Agriculture and food security	Dam construction for irrigation Introduction of new crops Change in planting and harvesting times	Development of tolerant/ resistant crop to drought, salt, insect/ pest
Human Health	Public health management reform	Developing of early warning systems
Ecosystems	Promoting agroforestry	Identification of species resistant to climate change
Costal zone	Protection and conservation of coral reefs, mangroves sea grass	Research and monitoring of coasts and coastal ecosystems

- Improvement of observation system
- Improvement public awareness
- Planning of strategic for disaster management
- Education, training
- Funding

Source : IMPACTS VULNERABILITIES and ADAPTATION in DEVELOPING COUNTRIES (UNFCCC)



Adaptation strategy example in costal area



Importance of networking in mangrove conservation



Coastal areas are often buffeted by storms and big waves, in addition to rise sea level. Communities in coastal areas need more attention. Efforts for adapting to the impacts of climate change are:

- Planning network for a costal conservation area to protect mangrove areas and coral reefs. These are organisms that can endure the coastal marine environment and can give protection against storms and large waves as well as ensure the availability of important natural habitats.
- Conserving and improving the quality of mangrove areas. Mangrove trees are able to reduce damage caused by flood and erosion, even from fierce ocean storms.
- Maintaining access to fresh water and food supplies.
- Preparing wetland areas as mangrove and coastal areas. Wetlands are needed as a migration location when sea levels rise. That way, protection from sea and coastal oceans can still be available for fish, crabs, and shrimp.

Networking is very important in order to improve the skill and awareness of the process of adaptation to climate change. The activity of networking is run by conserving mangrove areas near fisheries. Networking functions as a center to share information on the best techniques for cultivating and developing mangrove plants in fishpond areas. By employing several people to cultivate mangroves, communities can supply needed mangrove seeds and also supply extra income for residents.

2. DISASTER PREVENTION [Example in preventing damage from severe storms]



Disasters due to climate change have already taken place. One such disaster is severe storms. It doesn't only happen in inland areas but also on the ocean. Many fishermen cannot go out to sea to catch fish. Adaptation efforts in coping with storms reduce the risk of losses, especially lose of human life. The initial reaction to disaster is an important step in reducing the risk of larger climate change events.

There should be an effort to build awareness and skill in the community to reduce the risk of disaster. Assistance should be available when there are human victims and losses. There are three important steps in reducing the risk of disaster.

- (1) Preparation before a disaster occurs
- (2) Action during a disaster
- (3) Recovery after a disaster.

(1) Preparation before a storm

Several preparations for communities in high risk areas, especially coastal areas, are:

- Realizing the risk and making evacuation plans
- Practicing the evacuation plan
- Making roofs stronger with harder binding
- Developing an action plan in preparing for a storm
- Preparing the emergency supplies, for instance, candles, batteries, and food or three days which are necessary in the event of a storm.

When a storm comes, power may go out and the preparation of lighting and food is necessary.

- Preparing houses by covering windows and doors with wooden boards. Buildings will endure longer against severe weather openings are covered.
- Listening to radio for emergency information.

(2) Action during a storm

Even though it may be a panic situation, people should wait for rescue or evacuate calmly in order to reduce the risk during a storm. It is suggested to stay in the house until there is an evacuation notification to flee, or until the storm is over.



tions in the house are :

- Making all preparations
- Staying in the safest place in the house
- Turning off the gas, electricity, and all electronic appliances
- Listening to the radio in order to get current information
- Staying on the upper place if there is a flood

covery after a storm

tions have to be done after storm are:

Making sure that the conditions are safe and the storm is over. To allow the process of repairing the affected areas to proceed smoothly, it is better that people not directly involved in recovery process not gimped the process.

Using flashlights or candles as lighting. Do not turn on the electricity before it is safe. Stay away from fallen electrical cables on the ground.

Turning off the gas and electrical power. If it smells of gas, gas has to be turned off quickly, and it's necessary to ventilate the area. It is necessary to turn off the electric circuit as well. This should be done by someone who familiar with electricity.

Listening to the radio to get current information.

OF METEOROLOGY INFORMATION

Development of climate prediction and forecasting technology nowadays is getting better and better. Forecast results are more frequently correct than incorrect and it can be said that climate forecasting ability is getting better as well.

With this forecast technology, information about seasonal conditions can be known two or three months ahead of time. This information can be useful for farmers for devising a strategy to avoid unprofitable climate condition and taking advantage when the conditions have been predicted to be good.



possible that forecasting is not always correct and there may be some mistakes. Climate forecasts are able to achieve about 70% prediction rate; this means 7 out of 10 forecasts are correct. If such information is used consistently over a long period of time, farmers will be able to profit more than those who do not use this information. Research results in Bandung (Indonesia) show that rice paddy farmers, who use the climate information in deciding a planting system strategy, receive on average a higher income than those who do not use this climate information.

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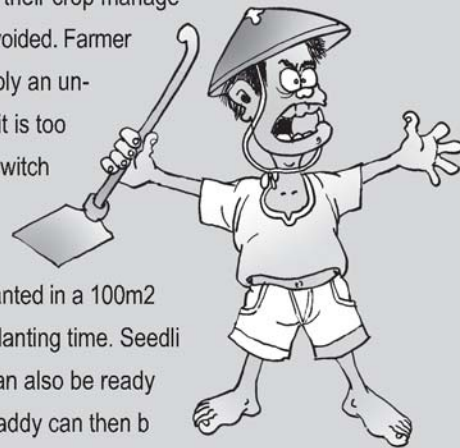
Study on use of meteorology information

Case 1. Paddy farmer's case

Java is affected by extreme climate events that increase during El Niño years. Crop failures rise on the season's second paddy harvest due to dryness. This happens because of: (i) The season's first paddy harvest planting time is delayed due to the delay of the start of the rainy season. Therefore, the rainy season is almost finished.

by the season's second paddy harvest planting time. (ii) The rainy season is shortened. If farmers can get information about these climate conditions 2-3 months before, they may be able to develop a strategy on how to tailor their crop management so that the risks can be minimized or avoided.

Farmers could push forward paddy planting or apply an un-irrigated rice field planting system. Even if it is too late for this step, the second crop can be switched to dry-resistant rice or non-paddy crops, or adapt the early harvesting system. In the early harvest system, the first harvest is planted in a 100m² nursery 20-25 days earlier than the usual planting time. Seedlings of the second harvest in the nursery can also be ready to be transferred to the field. The second paddy can then be planted as soon as the first paddy is harvested.



Case study on use of meteorology information

Case 2. Fishpond farmer's case

ramayu district, failure of shrimp farms happens frequently due to the inability to anticipate floods, which wash away the shrimp. If the flooding could be accurately predicted,

fishpond farmers could prevent loss by harvesting the shrimp earlier. Shrimp production also decreases if the salinity of the pond water increases. When the dry season lasts longer than usual, pond water salinity increases while fresh water supplies decrease. Instead, shrimp farmers can utilize their shrimp farming assets for other activities, such as salt farming. Salt farming would be more profitable during an extended dry season since salt production will be higher.



farmers/fishermen, the ability to adapt to climate change should be done by improving their ability to handle the climate risk. It is done by (i) improving the farmer/fishermen's ability to adjust their activities to the climate conditions or climate forecast information they receive.

(ii) providing and providing more technology to better use climate information. Technology using climate information can be arranged based on the information from climate forecasts to minimize the risk of climate change and maximizing profit from a climate condition that is well-predicted.

On the other hand, the government needs to provide support, infrastructure and policy in order for farmers/fishermen to use the climate information effectively. One important policy is creating an institution of technical supervisors who have sufficient knowledge of climate and the technology to make use of climate information.

di Boer /Head of Climatology Laboratory, Geomet Department, FMIPA, IPB)

ALLENGES AGAINST CLIMATE CHANGE THE ACHIEVEMENT OF USTAINABLE SOCIETY

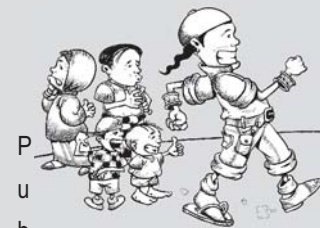


re some hints for a sustainable society :

riendly Transportation

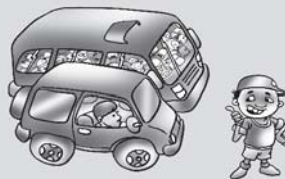
year, the number of private vehicle keeps on increasing, both motorcycles and cars. The increase of vehicle numbers on the street also means an increase in fuel consumption. Gasoline for vehicles is the result of fossil fuel processing and causes global warming. Reducing fuel consumption also means saving the energy for future needs.

Foot



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lic Transportation

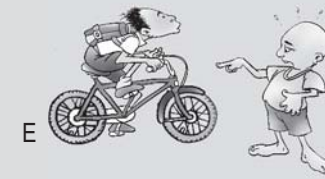


Climate change will happen continuously over the next few decades. However, the acceleration of global warming can be reduced and irreparable damage prevented. On a community level, emissions of greenhouse gases can be kept low if we choose to realize a sustainable society which does not contribute to global warming. And it is possible to realize this by simply and easily by using traditional knowledge and technologies.

When you remain in your community or neighborhood. It does not produce any pollution that contributes to global warming and it is also good for people's health.

Public transportation since it can economize fuel consumption. The use of a car with only one passenger needs to be reduced from now on. It is better to use public transportation, such as bus, so that fuel consumption can be brought down.

Environmental Friendly Vehicles



E

Environmental Friendly Driver



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v

Using Electricity

Electricity is one of the basic needs of modern society. The needs of electricity keep on increasing every year. Most electric power stations are using fossil fuel, and contribute to global warming. Some efforts to economize the use of electricity are needed. It is closely related to energy conservation. Reducing electricity use should be started right away.



environmental friendly vehicle. Choosing a vehicle that needs less fuel is a good effort to economize the use of fuel energy. It is better to use a bicycle which doesn't need fuel.

n

or to Eco-drive by doing things like driving at reduced speed, using the air-conditioner less and turning off the idling engine.

p

Large electrical appliances when not in use.

r

Turn off the lights when no one is in the room.

Choose products which need less electrical power and last longer.

Part of building an environmental friendly house, which does not need as much electricity lighting by allowing natural sunlight to enter the room.

e

Use electricity as efficiently as possible. Try to turn off and not to use electricity between 5-10 pm (Indonesia).

duction of Consumable Plastic



duce a plastic bag, enough fuel is used to run a car 115 miles (VOA). The plastic bag industry needs a lot of fuel to run its production activity for one day. Some small steps to reduce plastic consumption are:

- Use your own bag to go shopping. Try to get used to using your own shopping bag whenever you go to the market or supermarket. Refuse plastic bags when offered.
- Use your own food container to buy meals.
- Buy traditional plates or packing products with organic materials such as banana peels.
- Buy products without excess packaging or disposable products

Composting



Composting is an effort to recycle decomposable organic garbage into compost. It can reduce the amount of garbage. It can also be used for plants. Composting encourages community to make the sorting of other garbage, such as plastic or paper, for recycling easy. Thus, it can be recycled easily.

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Ministry of Environment Indonesia

Adaptation cases

Ministry of Education and Culture (Indonesia Development of Education and Perm culture)

HER

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