



### Our Mission

To promote, facilitate and coordinate effective environmental management and protection; and the sustainable use of Guyana's natural resources.

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## Climate Change - What is it?



## CLIMATE...WHAT IS IT?

Climate is the 'weather of a large area over a long period of time.'  
Climate can also be described as ' expected weather.'

We can measure climate by measuring the temperature and average rainfall over a long period of time (years).

Climate can be studied on different scales. At the smallest scale, the climate will only influence an area as small as a few miles across. On a larger scale, regional climates provide 'pictures' of weather patterns within individual countries.

Global Climate is the study of climate on the largest scale of all, it is the study of the world's climate. Climatologists study the global climate; they examine how it has changed in the past, and how it may change in the future.

### DID YOU KNOW?

A Climatologist is a scientist who studies climate

The simplest means of evaluating the state of the global climate is to measure the average global temperature of the Earth's surface and the atmosphere in contact with it.

### DID YOU KNOW?

Climate comes from the Greek word 'Klima' referring to the inclination of the sun

## ABOUT THE ENVIRONMENTAL PROTECTION AGENCY

The Environmental Protection Agency(EPA) was established under the Environmental Protection (EP) Act of 1996. This act gives the EPA the overall responsibility in Guyana

*"To take steps as are necessary for the effective management of the natural environment so as to ensure conservation, protection and sustainable use of its natural resources"*

Although an Environmental Unit was created in the Office of the President after the enactment of the EP Act, The EPA itself didn't become fully staffed and operational until 1998.

## THE WORK OF THE EPA

To implement steps and systems for the effective management of the natural environment ensuring conservation, protection and sustainable natural resource use.

To prevent or control environmental pollution.

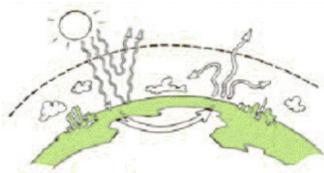
To coordinate the environmental management activities of all persons, organisations and agencies.

To play a coordinating role in the preparation and implementation of cross-sectoral programmes of environmental content.

To promote public participation in the process of integrating environmental concerns in development planning, ensuring sustainability.

To coordinate a national environmental education and public awareness programme.

## CLIMATE CHANGE... WHAT DOES IT MEAN FOR US?



Climate change is the change in "expected weather" in a region. Weather includes features such as temperature, wind patterns and precipitation(rainfall).The temperature of the earth is regulated naturally by the Greenhouse effect. This is the natural

'trapping-in' of heat by greenhouse gases present in the



## ECONOMIC BENEFITS

Using your waste for energy makes good sense.

✓ A good bio-energy system can reduce operating costs and improves reliability. At the same time, you increase your business' commitment to the environment.

✓ You eliminate the cost of waste disposal and you reduce energy expenses. The potential cost savings of using your own available fuel usually justifies the purchase and operation of a bio-energy system over a short period of time.

✓ using waste makes environmental sense because It recycles natural resources and reduces the quantity of waste that must be disposed.

✓ You also reduce the use of fossil fuels, which produce more pollution, such as sulphur dioxide. This will reduce the cost of power generation.

✓ Use of the waste resource locally reduces the need to purchase fuels for electricity internationally and is therefore not subject to fluctuations in price and currency.

✓ Rural areas can become energy self sufficient by converting biomass to energy or fuel.

✓ It can also cut down a country's dependence on energy imports and save costs on buying imports.

✓ Biomass resources are available in almost every part of the world and can be used as a source of energy indefinitely because waste will be continuously produced.

✓ the use of biomass provides significant benefits to other local industries. In some cases the amount of energy generated is enough to support surrounding industries. This can be another source of income for your mill.

✓ It provides employment in rural communities and keeps money in local economies. For example, farmers could set up a new business producing heat and electricity from fuel produced on their farms.

**DID YOU KNOW?**  
Biomass fuels are cheaper than fossil fuels, and are often waste material that must be disposed of.

atmosphere. Greenhouse gases are naturally found in air. They include carbon dioxide, methane and nitrous oxide. Greenhouse gases trap heat in the atmosphere. Without these gases, heat would escape back into space and Earth's average temperature would be about 60°F colder.

Greenhouses work by trapping heat from the sun. The glass panels of the greenhouse let in light but keep heat from escaping. This causes the greenhouse to heat up, much like the inside of a car parked in sunlight.



Greenhouse gases in the atmosphere behave much like the glass panes in a greenhouse. Sunlight enters the Earth's atmosphere, passing through the blanket of greenhouse gases. As it reaches the Earth's surface, the sunlight's energy is absorbed by the land, water, and biosphere.

Greenhouse gases balance incoming and outgoing heat and help to keep our Earth's temperature stable at about 15 C. Our activities are now causing an increase in the amount of these gases in the atmosphere. By increasing the amount of greenhouse gases, we have enhanced the warming capability of the natural greenhouse effect. It is this human-induced enhanced greenhouse effect that causes environmental concern.

## CLIMATE CHANGE - AM I RESPONSIBLE?

There are many causes of climate change. Some are natural and include processes that influence the flow of energy into, out of and within the climate system, such as changes in ocean circulation and changes in the amount of energy received from the Sun. Recently however, concern has grown that by polluting the atmosphere

**DID YOU KNOW?**  
The Earth's surface has warmed on average by about 0.6°C during the 20th century..



we may be causing changes in the global climate. By increasing the amount of greenhouse gases in the atmosphere through the burning of fossil fuels and deforestation, we have enhanced the Earth's natural greenhouse effect.

### IMPACTS OF CLIMATE CHANGE

Climate change affects everything, the plants and animals that inhabit a region, even the heating and cooling requirements of our homes and businesses. When the climate begins to change, all living things must adapt their lifestyles in order to survive. Global climate change could impact agriculture, ecosystems, sea level, weather, human health.

#### ✓ **Agriculture**

The steadily increasing world population has led to a rise in the demand for food. Increased demand for food means more land comes under agricultural cultivation, as a result there will be more pressure on natural ecosystems. Climate change will affect agricultural yield because of changes in temperature and rainfall, soil quality, pests, and diseases.

#### ✓ **Ecosystems**

The temperature and rainfall of a region may actually change as a result of climate change e.g. some forest regions could warm up, dry out, and become deserts. Since ecosystem evolution is generally a slow process, some elements of an ecosystem might have problems adapting to rapid climate change and may not survive. For example, increased ocean temperatures may cause a decline in fisheries.

#### ✓ **Sea level rise**

Coastal areas and small islands are among the most densely populated parts of the world. They are also the most threatened because of rises in sea level from warming of oceans.



- ✓ Reduces dependence on utilities thus improving the security of the energy supply.
- ✓ This saves disposal costs and in some areas, may reduce the companies' utility bills. In fact, many industries already rely on biomass to meet half of their energy needs. Industries that use biomass include lumber producers, furniture manufacturers, agricultural concerns like nut and rice growers, and liquor producers.
- ✓ Biomass technologies such as co-firing are easily implemented and fairly low cost compared to fossil fuels.



### ENVIRONMENTAL BENEFITS

Using biomass energy provides many environmental benefits. It can help

- ✓ reduce acid rain,
- ✓ mitigate climate change

#### DID YOU KNOW?

Burning of fossil fuels such as oil, coal and natural gas has a negative effect on environmental air quality. Burning biomass fuels instead of fossil fuels will substantially improve air quality.

#### ✓ **Acid Rain:**

Acid rain is caused primarily by the release of gases such as sulphur from burning fossil fuels. It has negative impacts on humans, wildlife and even waterways. Since biomass has less sulphur, using biomass fuel is a simple way of reducing sulphur emissions and thus, reducing acid rain.

#### ✓ **Climate Change:**

Climate change is a growing concern worldwide. Human activity primarily through the combustion of fossil fuels, has released hundreds of millions of tons of 'greenhouse gases' (GHGs) into the atmosphere. The biggest concern is that the greenhouse gases in the atmosphere will change the Earth's climate, disrupting the entire biosphere (the part of the earth where we live) which currently supports life as we know it. Biomass energy technologies can help minimize this concern.

don't use more than you actually need.

✓ **REDUCE AIR AND NOISE POLLUTION.** Car pools reduce the number of vehicles on the road which means less noise and a reduction in air pollution.

✓ **STAY WITHIN THE SPEED LIMIT.** Reducing your driving speed reduces fuel consumption. Steady driving gives you the greatest fuel economy.

✓ **REDUCE IDLING TIME.** Once the engine is warm, 10 seconds of idling uses more fuel than turning off the ignition and starting it again. Most vehicles need only 15 to 30 seconds of idling before being driven.

✓ **USE YOUR AIR CONDITIONER ONLY WHEN REQUIRED.** Using an air conditioner can increase fuel consumption by as much as 10% in the city and 3 to 4% on the highway.

✓ **DON'T SPILL FUEL.** Avoid fuel spillage from topping up or overfilling your tank at the pump.

✓ **KEEP THE ENGINE TUNED.** Fuel is wasted by such maintenance factors as poor spark plug condition, worn points or other ignition components, sticking valves, clogged fuel and air filters, and inadequate lubrication.

✓ **HAVE THE AIR CONDITIONER CHECKED FOR LEAKS.** As part of your regular maintenance schedule have a qualified mechanic check the air conditioning system.

✓ **MAINTAIN PROPER TIRE PRESSURE.** Tires should be inflated to the maximum pressure specified by the manufacturer. Under-inflated tires can increase fuel consumption significantly.

and melting of glaciers and polar ice sheets.

This is predicted to cause the average sea level to rise by about half a metre over the next century. Sea level rise could have a number of physical impacts on coastal areas, including loss of land due to flooding and erosion, and salt-water intrusion. These could adversely affect coastal agriculture, tourism, freshwater resources, fisheries and aquaculture, human settlements, and health. Rising sea levels threaten the survival of many low-lying coastal populations, such as communities along the coasts of Guyana and the islands of the Caribbean.



### ✓ **Weather**

A warmer climate will change rainfall patterns, lead to increased droughts and floods, cause melting of glaciers and polar ice sheets, and result in accelerated sea-level rise. Rising warmth will lead to an increase in the level of evaporation of surface water; The air will also expand and this will increase its capacity to hold moisture. This, in turn, will affect water resources, forests, and other natural ecological systems, agriculture, power generation, infrastructure, tourism, and human health.



### ✓ **Human Health**

Climate change may affect people's health both directly and indirectly e.g. heat stress and other heat related problems are caused directly by very warm temperatures and high humidity. Untreated, heat stress can be a very serious medical problem. Scientists suspect that, in many places, global warming will increase the number of very hot days that occur during the year. More hot days will increase the possibility of heat related health problems. Indirectly, damage to ecosystems, air pollution, changes in food and water supplies, and coastal flooding are all possible impacts that might affect human health.

## OPPORTUNITIES TO REDUCE GHG'S IN THE WOOD & RICE SECTOR

In Guyana, rice, timber and wood processing provide income and employment for a large segment of the population. Therefore it is important to ensure that these sectors remain environmentally friendly and sustainable.

In the rice sector 562,300 tonnes of paddy were produced in 2001. Three hundred and sixty-five thousand, four hundred tonnes (365,400) of rice was generated from the paddy produced of which 252,000 tonnes was exported. Thirteen Thousand (13,000) households depend on the rice industry for their daily income while an estimated 6000 people are employed in the industry

The estimated output of the forestry sector in 2001 included 4,565,849 logs and 4,992,771BM sawn lumber. This sector employs approximately 20,000 people. The exports from this sector total 359,421 cu. Ft. Of timber which contributed an estimated \$4.5 to the GDP

There were seventy four (74) mills operating in Guyana in year 2001. These mills produced 322,310 tonnes of rice, 209,502 tons (approximately 65%) of this quantity was exported.

## RICE MILLING

### Waste Generation and Disposal Practices

Straw, husk and bran are the by-products of harvesting and processing of paddy into milled rice.

Rice husks or hulls are resistant to natural breakdown. The large cone shaped heaps can be seen all over the coast near rice mills. These heaps are lit and allowed to burn for long periods of time. This method of disposal results in smoke, heat and dust nuisances to nearby residents.

## WHAT CAN YOU DO ABOUT CLIMATE?



✓REDUCE & REUSE. Try to reduce the amount of paper you use. Use recycled paper. Use both sides of the page.

✓REDUCE ENERGY USE. Replace the lights you use most with energy saving light bulbs. Energy saving light bulbs use 80% less energy and last 10 times longer than a normal light bulb.

✓LIGHTS OUT -- make sure that you always turn the lights off when you are the last one to leave a room.

✓PACK AN "ECO" LUNCH -- pack your lunch using reusable containers instead of plastic wrappers or bags.

✓BIKE OR WALK -- try biking or walking to school instead of driving. It is fun and good for YOU and the environment!

✓TURN, TURN, TURN -- Turn off and unplug stereos, radios, TVs, VCRs, and clocks when you leave for holidays. These appliances have a stand-by function that uses energy even when they are turned off.

✓SAVE MONEY AND ENERGY. People who live and/or work near each other, can save money as well as wear and tear on vehicles by pooling their resources and travelling together. Nearly one-third of the gasoline used is by people driving to and from work. Many of those people are travelling alone. If the same number of people used fewer vehicles, fuel consumption would be reduced.

✓BE ENERGY SMART! Eliminate unnecessary driving. Consider not driving at all. When you're heating water for tea or coffee,

## ADDITIONAL BENEFITS OF USING BIOMASS FOR ENERGY

In addition to the direct power and environmental benefits, biomass energy systems offer numerous other potential benefits, especially for developing Countries.

✓ The use of biomass will reduce the greenhouse gas emissions in the area - fossil fuels release large amounts of carbon dioxide (CO<sub>2</sub>) in to the atmosphere. Biomass also releases CO<sub>2</sub> as it burns, but the plants need CO<sub>2</sub> to grow thus creating a closed carbon cycle. Using biomass can reduce CO<sub>2</sub> emissions equal to the output of 30,000 cars and can generate electricity equal to 18,000 large solar panels when biomass is co-fired in a mid-sized power plant.



✓ Using biomass will improve health conditions in the homes. Since the waste is not burnt in the open, homes do not fill with smoke and ash.

✓ Burning solid waste for power generation can reduce the amount of garbage dumped in landfills by 60 to 90 % (by more than 2 million tons each year), and can reduce the cost of landfill disposal.

## SAW- MILLING AND WOODWORKING

Wood processing in Guyana includes saw-milling, lumberyards and furniture manufacturing. Woodworking usually results the creation of small wood waste particles such as shavings, sander dust, and sawdust.

The sawmills tend to be located mostly on the banks of rivers so the residents downstream of the mill will be affected by discharges of waste oil and the disposal of sawdust and other wood waste into the river.

### Disposal Practices

Wood waste is made up of primarily sawdust, wood scraps, chips and rejected logs. Processing and manufacture of the logs create supplies of residue such as trimmings, edgings, sawdust, sander dust, bark and low-grade chips.

Since all of the waste generated is utilized as fuel for steam generation the only concern is air pollution.

## ENVIRONMENTAL CONCERNS

✓ CO<sub>2</sub> and particulate emissions from incomplete combustion

✓ Noise from generators.

✓ Dust from collection and transporting processes.

✓ Waste oil - this is usually taken away to be used at logging.

✓ smoke.

✓ Waste Water

## WHAT IS BIOMASS?

Biomass is plant matter such as trees, grasses, agricultural crops, and other material derived from living matter. These materials are renewable and sustainable, and can be used as a solid fuel or converted into liquid or gaseous fuels.

## WHAT ARE THE MAIN FORMS OF BIOMASS?

There are many types of biomass, including:

- ✓ **Forest residues** - Wood from forest thinning operations that reduce forest fire risk.
- ✓ **Agricultural residues** - Crop residues such as corn stalks, bagasse from sugarcane rice straw and hulls and processing waste such as nut hulls.
- ✓ **Urbanwood waste** - Lawn and tree trimmings, wood pallets, construction and demolition wastes.
- ✓ **Energy crops** - Trees or shrubs grown specifically for energy.
- ✓ **Wood waste** - The by-products of logging and processing operations such as sawdust, timber slash and mill scrap.

### DID YOU KNOW?

About 13% of the world's primary energy comes from biomass

## GENERATING ENERGY FROM BIOMASS - Available Technology

### ✓ **Biomass Boiler, Steam Turbine Systems**

This method uses biomass in boilers to produce energy in cogeneration plants. A typical cogeneration system converts a burnable fuel into energy. The steam produced turns a turbine and the turbine drives a generator, producing electricity.

On a large scale, biomass, such as fuel wood, forestry residues, bagasse and solid waste, can be burnt in furnaces to produce heat, or steam to feed steam turbines. In developing countries, power generation is usually required in smaller amounts, and feedstock requirements can easily be met by agricultural residues such as rice husks, nut shells and wood waste.

### ✓ **Biomass Gasification, Gas Turbine Systems**

This method changes solid biomass into a synthetic gas by heating the biomass in an environment where the solid biomass breaks down to form a flammable gas. This gas can then be burned to create electricity, fuel a vehicle, for industrial use, or converted to 'synfuels' (synthetic fuels).

In locations, where biomass is already available (e.g. rice mills) or in industries using fuel wood, gasifier systems offer definite economic advantages.

### ✓ **Biomass Pyrolysis, Liquid Fuel, Gas Turbine Systems**

Pyrolysis is the breakdown of biomass in the absence of oxygen at high temperatures (above 250C.) This process produces a solid (charcoal), a liquid (bio-oil) and a mixture of gases. The products of pyrolysis are easier to transport and store than solid biomass material.

### ✓ **Biomass Anaerobic Digestion Systems**

Anaerobic digestion is another form of generating useful energy from biomass. It is the break-down of wet and green biomass by bacteria to produce a mixed gas known as biogas. The biogas produced can be burnt directly for cooking and space heating, or used as fuel to generate electricity.

### ✓ **Municipal Solid Waste (MSW) Boilers Systems**

Mass burning is the oldest, simplest and most popular method of recovering energy from municipal solid waste. In mass burn systems, untreated MSW is simply incinerated. The heat given off is converted into steam, which can then be passed through a turbine to generate electricity, used directly to supply heat to nearby industries or buildings, or to produce both electricity and low temperature heat suitable for space heating.