For further information and about Climate Change, you may contact GEC office. The school teachers can initiate activities with the students like doing street plays, puppetry workshops, bhavai, etc. GEC would be happy to help and encourage the schools for such initiatives.

Gujarat Ecology Commission
Government of Gujarat
Block No. 18, First Floor, Udyog Bhavan,
Sector-11, Gandhinagar - 382 017.
Tel. 23257656/23257658/23257659 Fax : 23257657
Website : www.gec.gov.in Email : admin@gec.gov.in
Published by:
Gujarat Ecology Commission (GEC)
Gandhinagar

Partner:
Gujarat University,
Ahmedabad

Concept, Research & Writing:
WAY
way.worldaroundyou@gmail.com

Design:
Pugmark Qmulus Consortium
Ahmedabad

© 2010 Gujarat Ecology Commission
Hint: Be on the right to be right

Across
1. It helps to convert the blowing energy
2. A way to manage your waste
4. Making new from the old
5. It is made from organic things & is not renewable. So save it.
7. It runs on energy but burns no fuel
8. Air, Water, Food, Shelter- it all comes from this

Down
1. you will find it not just around you but also within you. So save it.
3. it is hot but it's cool to use. Save fuel.
6. Gives light, saves energy

We know you are looking for the index page here. Index is the easiest way to avoid reading the whole book. We have not kept the index because every page in this book is important for you and the world around you.
RECYCLING HELPS:
Plastic: 1.4 tonnes of GHG saved for every tonne recycled.
Glass: Each recycled tonne avoids the use of a tonne of raw material and saves another 300kg of GHGs.
Metals: Recycling just one tonne of aluminium will save 14 tonnes of GHGs.
Paper & cardboard: Every tonne recycled saves over 2 tonnes of GHG emissions.

ENERGY SAVINGS:
Turn off your appliances when not in use. Turn them off from the mains and even pull out the plug. Stand-by appliances consume energy.

<table>
<thead>
<tr>
<th>Appliances</th>
<th>When in Stand-by mode (watts)</th>
<th>When on (watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stereo</td>
<td>12</td>
<td>22</td>
</tr>
<tr>
<td>T.V.</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Video Recorder</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>DVD player</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Computer + Peripherals</td>
<td>15</td>
<td>130</td>
</tr>
<tr>
<td>Computer monitor</td>
<td>11</td>
<td>70</td>
</tr>
<tr>
<td>Laptop</td>
<td>2</td>
<td>29</td>
</tr>
<tr>
<td>Broadband modem</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Cell phone charger</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Digital TV set top box</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: The Sustainable Girton Project
One tree can absorb the amount of CO$_2$ released by an average car that has been driven for 4000 miles (6437 km).

A single mature tree can absorb carbon dioxide at a rate of 48 lbs./year and release enough oxygen back into the atmosphere to support 2 human beings.

Over a 50-year lifetime, a tree generates Rs.14,06,250 worth of oxygen, provides Rs.27,90,000 worth of air pollution control, recycles Rs.16,87,500 worth of water, and controls Rs.14,06,250 worth of soil erosion.

For every tonne of paper recycled, we save 17 trees and 2250 litres of oil use to generate power to produce paper.

**LIMITED PERIOD OFFER : OFFER TILL STOCK LASTS**

**OIL - 45 YRS, GAS - 72 YRS, COAL - 252 YRS**

<table>
<thead>
<tr>
<th>The time waste takes to degrade:</th>
<th>Vegetables / fruits</th>
<th>Paper bag</th>
<th>Wood</th>
<th>Aluminum</th>
<th>Plastic bags</th>
<th>Thermocol glass</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3 weeks</td>
<td>1 month</td>
<td>10-15 yrs</td>
<td>200-300 yrs</td>
<td>300-400 yrs</td>
<td>Never</td>
<td></td>
</tr>
</tbody>
</table>

We knew, most of you must be in a hurry to flip through this book like most other “climate change books”.

For those who are in hurry...

If u want to know

**WHAT IS CLIMATE CHANGE**

If u want to know

**WHAT IS GREEN HOUSE EFFECT**

If u want to know

**WHAT ARE THE REASONS OF GLOBAL WARMING**

If u want to know

**WHAT ARE THE EFFECTS OF CLIMATE CHANGE**

If u want to know

**WHAT SHOULD BE DONE TO STOP CLIMATE CHANGE**

If u want to know

**WHAT YOU CAN DO TO STOP CLIMATE CHANGE**

If u are a

**TEACHER, don’t miss**

If u want to

**GET MORE KNOWLEDGE ON CLIMATE CHANGE**

If u want to

**TEST YOUR KNOWLEDGE ON CLIMATE CHANGE**

If u wish to

**WEAR & SHARE**
Climate is the long-term average of a region's weather events. Climate change represents a change in these long-term weather patterns.

Climate change is a natural phenomenon in which Earth's temperature varies with changes within it and outside it. Ever since the Earth was formed about 4.6 billion years ago its temperature has been changing. The temperature of the Earth in the past was much warmer and colder than today.

Why then the term climate change sound so frightening to us today? It is scaring because the Earth is heating up fast. For the first time in history, the man and not the nature is causing the climate change, what is commonly known as global warming.

Global warming refers to an average increase in the Earth’s temperature, which in turn cause changes in the climate.

Climate change refers to a statistically significant change in either the state of the climate or its variability, persisting for an extended period (typically decades or longer). Climate change may be due from natural internal processes or to persistent anthropogenic changes in the composition of the atmosphere or in land use.

Note for Teachers

1. Set up a recycling bin: Let students drop in their paper, aluminum, plastic and glass products to learn about means of disposal beyond the garbage can.

2. Incorporate up-cycling art projects: Encourage students to bring in leftover bits of packaging, paper, Styrofoam, or other disposables and create art projects from them. Resultant projects may be taken home or donated to charity.

3. Get permission for an outdoor compost heap: If the school and maintenance workers do not mind, set up a compost heap on the school grounds. This teaches students how to turn their organic waste into something conducive to nursing plant.

4. Grow plants: Plant flowers or vegetables in small containers in the classroom or in approved compost heaps on the school grounds. Students learn not only sustainability and self-reliance, but the growth process and interdependence between plant and animal species in an ecosystem as well.

5. Set an example: Teachers must never ask students to do anything that they themselves would not. That means fully participating in the projects.

6. Organize special clean-up days: Work with the school and maintenance workers to organize weekly clean-up time where students clean the grounds by picking up any litter they encounter.

7. Inspire students to use both sides of the paper: One of the simplest ways to promote responsibility with resources is to require students to use both sides of their paper before beginning a new one.

8. Use natural light whenever possible: For classrooms advantaged with large windows, forego switching on the lights during bright, sunny days.

9. Require room checks at the end of the day: Before sending kids home for the day, have them peruse the classroom for anything they suspect may be wasting resources or cause harm to the environment.
AVOID PLASTICS:
- Bring cloth bags or string bags to your supermarket to carry groceries home.
- Choose refillable, reusable containers made of glass, ceramic or stainless steel.
- Choose packaging that's made from the most easily recyclable materials: paper, glass, metal cans.
- Avoid plastic cutlery and dinnerware. Use metal utensils and look for recycled paper plates.

SAVE ENERGY:
- Turn off the lights when you leave a room.
- Use CFL & LED lights in your room.
- Turn off your computer or the TV when you're not using it. Unplug chargers when not in use.
- Wait until you have a lot of clothes to wash before using the washing machine. Don't use the machine for one item just because it is your favorite shirt.
- Close the blinds on a hot day if the sun is shining in. Dress lightly instead of turning up the air conditioning or use a fan.

A warmer Earth may lead to changes in rainfall patterns, melting of ice, a rise in sea level, which in turn has a wide range of impact on plants, wildlife and people.

When scientists talk about global warming they express concern about the human activities that causes it. They point out that global warming started because of the Industrial Revolution when we began burning fossil fuels in large quantities.
Greenhouse effect

Sun as source
When the sun’s radiation reaches our atmosphere, some is reflected back into space while some passes through and is absorbed by the Earth. This causes the surface of the Earth to warm up.

The Greenhouse Effect
Heat from the Earth is radiated outward and is absorbed by “Greenhouse Gases (GHGs)” in the atmosphere. This process prevents heat from disappearing into space and keeps Earth warm enough to sustain life.

Greenhouse gases and Global Warming
Some human activities (primarily the burning of fossil fuels) intensify the warming effect by releasing additional greenhouse gases in the atmosphere, which in effect traps more heat and leads to increase in temperature.

Since the Industrial Revolution, the need for energy to run machines, vehicles and gadgets has steadily increased. To meet the increasing demand of energy, man started using more and more fossil fuels like coal and petroleum. Burning of these fuels has been releasing more greenhouse gases into the atmosphere. The main greenhouse gas responsible for recent climate change is carbon dioxide (CO₂).

Greenhouse gases include carbon dioxide, methane and nitrous oxide. These are released from various sources and have different heat-trapping capacities. The CO₂, that nature emits from the ocean and vegetation gets absorbed again by the ocean and vegetation. It is the emissions by human activities that upset the natural GHG’s balance.

The human population emits 26 gigatonnes of CO₂ every year but the net increase in CO₂ level is 15 gigatonnes per year. Because much of human CO₂ emissions get absorbed by natural carbon sinks like oceans and forests.

- Celebrate the spirit of giving: Every time you receive a new toy, donate one old toy. This will reduce the stuff that ends up in landfills, and brings joy to kids that are less fortunate than you.
  - Walk short distances or use bicycle instead of asking for a ride in a car.
  - Plant a tree & give it your name.
  - Take shorter showers. Heating water uses energy.
  - Spending more time with family and outings instead of watching TV. By this you make your family happy, you save electricity and you don’t put on weight by being a couch potato.
  - Avoid use of firecrackers.
  - Taking the stairs might not always be possible, but if it’s only a few floors try to ignore the elevator or escalator as often as you can.
  - Do rain water harvesting.
  - Don't throw rubbish everywhere. Use dust bins.
  - Carry a water bottle from home with you instead of buying bottled water. You don’t spend money on packaged water and you reduce plastic wastes in return.
  - If you can, buy your food from local farm shops and try to avoid imported goods. Trucks and planes bringing in food and stuff from other countries, or from distant parts of your country, use huge amounts of fuel.
  - Speak to at least one person and encourage them to join you. After all, little drops make an ocean. Let’s preserve the Earth for our own good and for our children.
What **YOU** can do?

**REDUCE - REUSE - RECYCLE**

Did you know that you can help the environment if you buy recyclable products instead of non-recyclable ones? Look for the recycle mark – three arrows that make a circle – on the package. Recyclable products are usually made out of things that already have been used. It usually takes less energy to make recycled products than to make new ones. The less energy we use, the better.

- Cut old clothes up to use as cleaning wipes
- Re-use old carry bags when you go out for shopping
- Your old boots make great plant pots!
- Choose reusable items rather than throwaway one
  e.g. pens, pencils, etc.
- Choose refillable cleaning products and perfume bottles
- Rather than throwing away old utensils, books, clothing and items that are in good shape, consider donating them to people who need them. Many of you can even work with friends, teachers & parents to motivate others.

- Bring home recyclable items from school: If your school doesn’t have a recycling program, bring home items that you can recycle at home, such as can, plastic bottles, cardboard, etc.

---

**Reasons for Global Warming**

Two major reasons of global warming are:

1. **Increase in population**

   The world’s population grew nearly four times during the past 100 yrs. More people ➔ more consumption ➔ more production ➔ more fossil fuel burnt ➔ more greenhouse gases released.

   By the time you finished reading this sentence, about 17 babies were born around the world.

2. **Changing lifestyles**

   It is not just the number of people; it is also about how we choose to live. Life in large cities is comfortable and convenient, but energy this lifestyle requires has a huge environmental cost.

   One survey says, with an average increase in income by Rs 1000/-, 1 kg of waste gets added on Earth.
POWER
is consumed in different forms and proportions by us. Production of power is the world’s biggest climate polluter, responsible for 37% of global CO2 emissions from burning of fossil fuels.

INDIA RELEASES OVER 1100 MILLION TONS OF CO2 ANNUALLY FROM ENERGY USE.

TRANSPORT
Cars, buses, and trucks are the principal ways by which goods and people are transported in most of our cities. These are mainly run on petrol or diesel, both fossil fuels.

MORE THAN 11.25 LAKH NEW VEHICLES HIT THE ROAD IN INDIA IN 2009.

WASTE
We generate large quantities of waste in the form of plastics that take centuries to decompose and cause damage.

URBAN INDIA PRODUCES 1,20,000 TONNES OF WASTE EACH DAY.

URBANIZATION
Rapid urbanization and increased consumption of timber and paper has caused forests to shrink as trees were cut on a mass scale.

ANCIENT FORESTS ONCE COVERED HUige PROPORTIONS OF THE EARTH, BUT WE HAVE ALREADY CUT, BURNED, OR CLEARED 80% OF OUR ORIGINAL PRIMARY FORESTS.

AGRICULTURE
High-yielding varieties of crops require large quantities of fertilizers; and more fertilizer means more emissions of nitrous oxide, both from the field into which it is put and the fertilizer industry that makes it. Pollution also results from the run-off of fertilizer into water bodies.

Save energy
One easy way to shrink your carbon footprint is to save energy. Most of us waste energy, when heating, cooling, and lighting our homes, when running electrical appliances and gadgets. Small steps like changing light bulbs to CFLs & LED and switching off gadgets might not seem important, but they can help to reduce greenhouse gas emissions.

Less Waste
Most of our household waste lands up in solid waste landfills. These huge trash dumps release methane; a greenhouse gas-as they decompose. One simple way to cut methane that is released to reduce the amount to trash your produce, and recycle as much as possible of what is left.

Eco Homes
Almost a third of greenhouse gas we produce comes from our homes. The good news is that there are many ways, ranging from how our homes are built to the way we live inside them, by which we can reduce the amount of greenhouse gas we create.
What should be

**Geothermal Power**
The word *Geothermal* literally means “Earth Heat”. If you travel 10,000 feet below ground, the temperature of the rock there would be hot enough to boil water. (If water deep down in the Earth gets heated by this rock and comes up through a crack in the Earth’s surface, this phenomenon is called a hot spring or a geyser). In Iceland, many buildings and swimming pools are heated with geothermal hot water. Even power plants can run on geothermal power.

---

**Biomass Power**
Believe it or not, dead trees, yard clippings, wood chips, straw, bushes, switch grass, and composting material can produce electricity, heat, and fuel. Before this stuff was trash, it was alive, which means it was a part of the natural carbon cycle. That means it stored energy in the form of carbon. Recent discoveries have even found a way to convert leaves and plant stalks into the alternative fuel ethanol. If we use just one eighth of the total biomass produced on earth each year, it would cater to all the energy needs of every single person on the planet.

---

**Solar Power**
Though the sun is about 93 million miles away from the earth, it can power anything from pool heaters to cars as long as it is harnessed properly. Solar panels (also called photovoltaic cells), solar hot water systems, and solar-thermal (Thermal=Heat) power stations are some of the ways to use the sun’s energy.

Effects of Climate Change

When our climate changes, there will be changes in the world around us. Our environments include the oceans, the fields where we plant crops, the air we breathe and the water we drink. Air pollution, changes in food and water supplies, coastal flooding and ecological disturbances are all examples of possible impact of climate change.

---

**HUMAN HEALTH**
A rise in temperature is expected to cause an increase in infectious diseases. Also the number of insects that carry diseases like malaria & encephalitis may increase & may move to warmer areas.

---

**DISAPPEARING WORLD**
Climate change may alter the world’s habitats and ecosystems. Life on Earth depends on a delicate balance of rainfall, rapid change in climate and seriously organisms. While destruction of part, climate change causes, such as higher rainfall pattern, and extreme weather, make the situation more serious.

Even if global temperatures rise by only 2°C, 20-30% of species could face extinction
**SEA LEVEL RISE**

As water warms it expands, like liquid in a thermometer. A warming climate will heat the oceans, causing sea levels to rise. Coastal flooding could cause saltwater to flow into the land masses, endangering crops and animals.

**SHRINKING ICE**

Large amount of water is locked in glaciers, permafrost and ice-caps around the world. Warmer weather is causing these to melt. Water from land-based ice will flow into the oceans, raising sea levels. Various glaciers which feed many perennial rivers of India are receding due to global warming. This will significantly affect the flow of rivers and can affect the water supply of many regions.

Around 1.5 billion people currently live in water-stressed regions. Climate change and population growth could increase this to nearly 7 billion by the 2050s.

**FOOD SECURITY**

Reduced rains in the tropics and subtropics, shifting seasons and more intense extreme weather conditions will severely affect the crop yields world over. This will leave hundreds of millions of people dependent on agriculture without a livelihood. Also, it will disturb the food security of the coming generations.

In South Asia alone, the agriculture produce is expected to drop by 30% by the end of this century because of climate change.

Might be the good effect of climate change:

Ice melting in Greenland has improved the economic circumstances of sheep herders and farmers. The growing season has lengthened, allowing vegetables such as potatoes to be sown there.