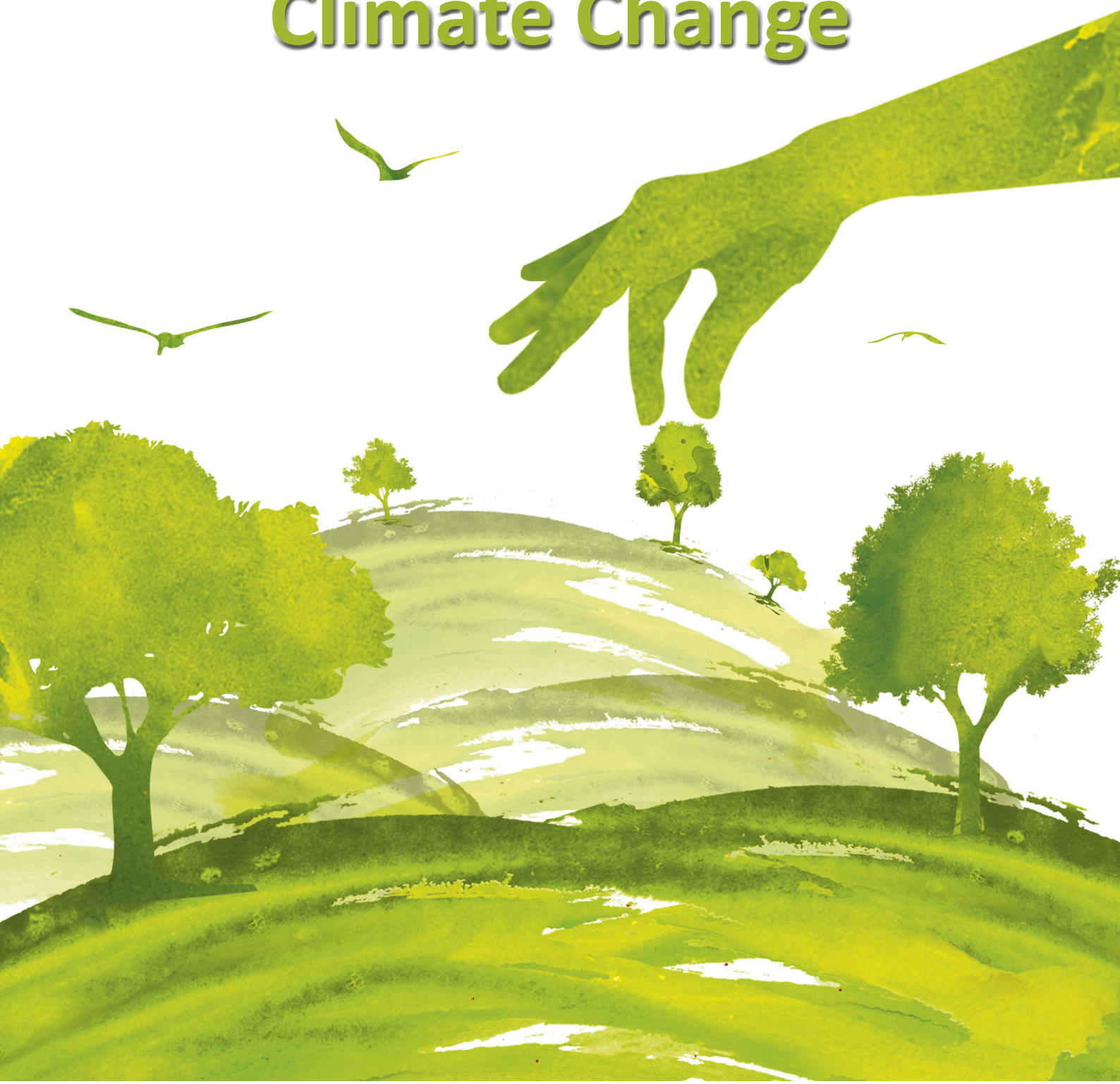
Green Guide for Teachers on Climate Change



The Climate Reality Project INDIA

THE CLIMATE PROJECT FOUNDATION

Green Guide for Teachers on Climate Change

We have created this Green Guide for Teachers on Climate Change because we endorse that teachers are one of the first lines of defence in the environmental movement. We acknowledge that climate change is one of the most impeding issues of our time and that the upcoming generation will decide the fate of this planet. When it comes to teaching children we believe that teachers are the best guides. The interdisciplinary skills they learn today will be the planet-saving skills they enlist tomorrow.

Greening your school doesn't necessarily have to be about the big things like building a rain-water collection system or installing solar panels. Getting big things done is great, but it can also be as simple as opening the eyes of a child to the native plants just beyond the playground, or helping a students be conscious of their carbon footprint as they come or go from school. Whether you are in an urban, suburban, or rural location, and no matter if you're a public or private school employee, there's a lot every teacher can do to inspire his students to make the world a little greener.

We have created this Guide to help you communicate climate change with your students better, inside as well as outside the classroom.

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“Teachers, I believe, are the most responsible and important members of society because their professional efforts affect the fate of the earth.”
— Helen Caldicott

Content

History of Climate Change

Objective

The Earth has experienced many climatic variations in the past however we need to acknowledge that the present climate change is more human-induced than natural.

Key Words

Climate Change, Greenhouse gas effect, Climate

Content

We all have heard about Ice Age! Our Earth has undergone seven cycles of glacial advance and retreat due to climatic shifts on the planet. These changes have been caused by various factors, such as variations in the

earth's orbit around the sun, tectonic movement, variations in solar output, eruption of volcanoes and meteorite impacts. However, since the 18th century scientists have been trying to understand and study the “Greenhouse Effect of the Atmosphere” many drew up the connection between burning fossil fuels and increasing greenhouse gas effect. Once such scientist was John Tyndall who discovered that gases like carbon dioxide which is released on burning fossil fuels (coal) contributed to the greenhouse gas effect. By the 1960’s the world acknowledged that greenhouse gases like CO2 caused the greenhouse effect as they trapped heat from escaping the Earth leading to warming of the planet.

Scientists have been studying the changes in the climate with the help of tree rings and ice cores. Tree rings and ice cores are sensitive to the changes in the climate, therefore, they help scientist learn about the changes that have been taking place in the climate over many years.

The tree rings indicate how much a tree has grown each year, with each ring representing one year. In warmer, wetter years, the tree will grow more so the ring for that particular year will be wider than the ring formed during a colder year. By studying the width of the tree rings, scientists can learn about the changes in weather over the tree's lifetime.

Ice is formed through the process of continuous deposition and compaction of snow layers. Since permanent ice rarely melts even in summer, it is a reliable indicator of climatic conditions in the earth's history, with the age of deposition increasing with depth. A circular sample of such permanent ice drilled to study the ice layers is called an 'ice core'. Greater density in ice layers indicates cooler temperatures, and lower density indicates warmer climates.

In the past 50 years, scientists have noticed that the width of the tree rings have been getting wider, which indicates that the global temperatures have been increasing.

Activity One

Understanding Climate Then and Now!

Purpose

This activity will help students in understanding the changes in the climate that have taken place over the years. They will be able to make a comparative analysis of the changes in the climate in the day of the grandparents and the climate that they are facing today.

Duration of the Activity

1 month

Materials Required

Computers with access to internet, survey paper, pen/pencil

Objectives:

- Explore the changes in the climatic conditions that have taken place over years.
- Making a comparative analysis of the climate then and now.
- Make a presentation in class.

Process

- Students will be interviewing their grandparents and other elderly people of their society.
- Then ask each student to list the ways in which this climate directly affects his/her life (for example, low temperatures during winters allows me to sit out in the lawn and enjoy the warm sunlight).
- Students should now make a judgement based on their own observations, as to whether the climate now is significantly different from their grandparent's time, and if so what was different about it.
- Have each student record their answer on a sheet of paper and make a comparative analysis.
- The student will now make a presentation to the class.

Outcome

Apart from learning about climate change this activity will help students to communicate effectively with a variety of audiences and for different purposes. This will also help in building confidence amongst students.

Weather and Climate

Understanding the Difference!

Weather reflects the short-term conditions of the atmosphere at a specific time and place. For instance, how cloudy or sunny it is, how windy it is, and so on.

Climate on the other hand is the average daily weather for an extended period of time for a given place or region. For instance, you have always heard people say that Delhi has an extreme climate, the summers are very hot and the winters are cold. The hot summer and cold winter is the climate of Delhi. Climate change is the long-term alteration in the average weather conditions for a particular location.

Our weather is controlled by the Sun. As the Earth rotates on a tilted axis all parts of the planet do not get equal amount of heat. Different parts of our planet are heated by different amounts of Sun's energy at different times of year, making some regions hotter than others and causing the seasonal changes. The temperature variations between one part of the

world and another gives rise to differences in air pressure, thereby producing winds and storms. Scientists believe that greater amounts of greenhouse gases like carbon dioxide in the atmosphere and will cause hotter temperatures on Earth thereby significantly changing the climate across the whole planet. Therefore, climate change refers to any significant change in the climate (temperature, rainfall, or wind) that lasts for an extended period of time.

Climate change may result from the following –

Natural factors such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun

Natural processes within the climate system (e.g. changes in ocean circulation)

Human activities that change the composition of gases in the atmosphere such as burning of fossil fuels, deforestation, industrialization, etc.

Understanding the Science of Climate Change

Objective

Understanding the science behind climate change. We now know that anthropogenic activities have contributed to climate change.

Key Words

Climate, Weather, Carbon Dioxide, Earth

Content

As the Earth's climate have continued to evolve over recent decades, increasing evidence of anthropogenic influences on climate change has been found. The reason the Earth's surface is warm is because of the presence of the atmosphere, which act as a partial blanket for the longwave radiation coming from the surface. This blanketing is known as the natural greenhouse effect of the Earth which is necessary for our very own existence.

Greenhouse Effect

When visible light from the Sun hits the earth, some of the radiations are absorbed and used to heat the earth. The heated earth, in turn, gives off infrared radiations, which is re-radiated back into space. However, certain gases in

the atmosphere absorb the infrared heat that would normally be radiated back into space. This progressive heating of the earth's surface due to the gradual building up of infrared radiations within the atmosphere, caused largely by the accumulation of greenhouse gases is known as Greenhouse Effect.

Over the years human beings have altered this very life protecting blanket over our planet that we call the atmosphere. Human activities like burning coal to produce energy, transportation etc. have intensified the blanketing effect of the atmosphere through the release of greenhouse gases like CO2. For instance, the amount of carbon dioxide in the atmosphere has increased by about 35% in the industrial era, and this increase is known to be due to human activities, primarily the combustion of fossil fuels and removal of forests. Thus, humankind has dramatically altered the chemical composition of the global atmosphere with substantial implications for climate.

In 1938, scientist G. S. Callendar solved a set of equations linking greenhouse gases and climate change. He found that a doubling of atmospheric CO2 concentration resulted in an increase in the mean global temperature of 2°C, with considerably more warming at the poles. He also linked increasing fossil fuel combustion with a rise in CO2 and its greenhouse effects.

"As man is now changing the composition of the atmosphere at a rate which must be very exceptional on the geological time scale, it is natural to seek for the probable effects of such a change"

By now we know that burning of fossil fuels causes the release of greenhouse gases and these greenhouse gas in turn causes the greenhouse effect leading to an accelerated increase in the temperature of the Earth.

Major Greenhouse Gases

The blanket around our planet called the atmosphere comprises of a layer of constantly moving gases. The Earth's atmosphere is made up of Nitrogen (about 78%) and Oxygen (about 21%). The rest of the 1 % is made up of trace gases (including the greenhouse gases).

Carbon dioxide

Carbon dioxide is the most potent greenhouse gas responsible for over half the effect of global warming. Carbon dioxide is naturally occurring in the Earth's atmosphere and in oceanic and forests. Carbon dioxide is balanced in the atmosphere through the carbon cycle but nowadays the cycle is being disrupted as we are pumping great amounts of CO2 into the atmosphere. Since the start of industrial revolution the percentage of CO2 in the atmosphere has increased exponentially. Ever since then, human beings have been emitting carbon dioxide into the atmosphere in their pursuit for industrialization, economic growth, and better lifestyles.

Methane

Methane is the second biggest contributor to climate change. The main causes of this increase are the digestive processes of cattle and sheep, cultivation of rice, decomposition of waste in garbage dumps and landfills, and the escape of natural gas into the atmosphere.

Nitrous Oxide

The level of nitrous oxide level in the atmosphere has increased since the last many years. The main causes for this increase are indiscriminate use of nitrogenous fertilizers in agriculture, burning of vegetation and emissions from industries.

Chlorofluorocarbons

Chlorofluorocarbons had been in the news with respect to the ozone layer. Chlorofluorocarbons are one of the greenhouse gases that have caused a rise in the global temperatures in the past century. Their concentration in the atmosphere has been reduced since they were phased out to protect the ozone layer.

Water Vapour

Although Water Vapour is the most important greenhouse gas with the highest concentration in the atmosphere, human activity has little or no direct impact on its concentration in the atmosphere. However, increasing global temperatures result in greater water vapour concentrations as higher temperatures increase evaporation rate and release larger volumes of water vapour into the atmosphere.

How do humans contribute to the Greenhouse Effect?

We now know that human activities have contributed to climate change. Since the beginning of Industrial Revolution, the concentrations of greenhouse gases (GHGs) in the atmosphere have increased drastically due to human activities.

Use of fossil fuels:

Fossil fuels like coal, oil, and natural gas are rich in carbon and emit vast amounts of carbon dioxide, nitrogen oxides and sulphur dioxide when ignited. Carbon rich fossil fuels are being extensively used for generating electricity for artificial power as well as at homes and industries as a fuel. The electricity in our homes and schools come from burning of fossil fuels in power plants.

Deforestation:

We know that trees absorb CO2 and give us fresh oxygen. However, deforestation caused by human beings has caused two damages. Firstly,

cutting trees releases vast amounts of carbon (that was previously stored in the plant body) in the form of carbon dioxide into the atmosphere. Secondly, the number of trees available to absorb and recapture the atmospheric carbon dioxide is reduced. As a result, the carbon dioxide concentrations in the atmosphere increase drastically.

Energy:

We all agree that energy has brought us a lot of comforts from living in air conditioned houses, to watching TV, switching on the fan etc. this energy comes from burning fossil fuels and most of India's energy requirements

are satisfied by fossil fuels alone. Renewable sources of energy are still being explored in our country. Most of our power comes from thermal power stations that use coal, are one of the largest emitters of carbon dioxide.

Transportation:

Transportation like cars and buses are responsible for emission of huge volumes of GHGs. We go to our schools in buses. Every trip emits CO2 that is harmful to our planet's well being.

Industry:

The industries are largely dependent on fossil fuels for their energy needs. They consume vast amounts of coal and other fossil fuels and ultimately emit huge quantities of greenhouse gases.

Agriculture:

Methane is the second largest greenhouse gas. It is released from cultivation of paddy in flooded rice fields. Even cattle and other farm animals generate small quantities of methane.

Wastes:

The decomposition of wastes in the municipal garbage dumps and sanitary landfill sites emits large quantities of methane gas. Open burning of solid wastes, which is quite common in our country, generates a lot of smoke in addition to emission of gases like carbon dioxide, carbon monoxide etc.

Activity Two

Understanding Greenhouse Gas Effect

Purpose

This activity will help students in understanding the greenhouse effect. They will be able to understand how heat get trapped and stimulates changes.

Duration of the Activity

1 day

Materials Required

Jar, 2 thermometers, pen/pencil

Objectives:

Students will understand how greenhouse effect works and will see the effects in real time.

Process

- On a sunny day, lay two thermometers side by side on the same kind of surface outdoors. Label them as T1 and T2.
- Immediately record the temperatures shown by both the thermometers.
- Then cover the thermometer labelled T2 with a large clear glass jar (which simulates a greenhouse). Wait for 30 minutes.
- Then read the temperature of the two thermometers.
- Carefully replace the glass jar over the thermometer labelled T2.
- Wait for another 1 hour and read the temperatures of the two thermometers again. Observe and carefully record the difference in

temperatures between the two (if any).

Outcome

The thermometer T2 will depict higher temperatures than thermometer

T1. Ask students why?

You may then start a discussion on the phenomenon called “Green House Effect”. Although the same amount of sunlight hits both the thermometers, the sunlight entering the glass jar heats up the air within the jar. The glass jar covering the thermometer T2, traps the heat and does not allow it to escape, as in a green house. As a result, the temperature levels within the glass jar is higher than the usual atmospheric temperature. Therefore, thermometer T2 which is placed within the glass jar shows greater temperature level than thermometer T1 which is placed uncovered in the open.

Impacts of Climate Change

Objective

We will now understand how climate change will impact us and our ecosystem as a whole.

Key Words

Fossil Fuels, Climate Change, Greenhouse Gases

Content

The use of fossil fuels for electricity generation, factories, transportation etc. has led to emission of greenhouse gases, such as carbon dioxide and methane in significant amounts into the atmosphere. This addition of greenhouse gases have induced earth's atmosphere to warm even more quickly than it had been in the earlier times. Such an altered atmosphere is bound to have varies impacts across the system.

Impacts

The various impacts of climate change that humankind has witnessed are listed below:

Extreme weather

We have all heard about the recent heat wave in India that took the lives of many people. Scientists believe that such events of heat waves are only bound to increase given the ongoing climatic changes around the world. Changes in the temperature will increase the frequency of droughts and floods and would negatively affect agricultural produce.

Health

Climate change will also have health impacts as warmer temperatures will prove to be conducive for breeding of disease spreading mosquitoes. As temperatures will get warmer in the higher altitudes there is a very high probability that diseases causing mosquitoes will spread to such regions.

Impacts on Agriculture

Extreme weather conditions caused by climate change will have a direct effect on the agricultural sector of the country. Erratic weather conditions such as high temperature, droughts and floods adversely affect the agricultural produce. Our country has an agrarian based economy therefore such changes are bound to hurt the economic growth of the country as well.

Melting of Glaciers

One of the most dramatic impacts of climate change can be seen on the glaciers. Glaciers have in the recent past receded at an alarming rate. One such example of a glacier is the Gangotri glacier up in the Himalayas. Scientists at NASA have noted that in the last 25 years this glacier has retreated at a greater rate.

Rise in Sea Level

Rapidly melting glaciers pose a great risk for nature. For instance, the endangered Royal Bengal tiger will lose a large portion of their worldwide habitat as the Sundarbans succumb to sea level rise, thereby threatening their existence. Climate change also causes a phenomenon called thermal expansion. As temperature increases it causes the water to of the oceans to also expand just as it happens when you boil a pot of water. The rise in sea levels poses a threat to low-lying areas; thus, eroding shores, damaging property, and thrashing ecology as a whole. Bangladesh is at the forefront of sea level rise dangers.

Impact on Biodiversity

Climate change has had one of the most drastic impacts on biodiversity. Experts believe that by 2050, one-fourth of the animal species on earth will head towards extinction as a result of this perpetual global warming. Changes in temperature, weather, and vegetation are forcing animals to move towards cooler regions of the earth for survival, which is likely to affect their existence as a whole.

Impacts on Water resources

With climate change we are also experiencing a population boom. Climate change coupled with population growth will have significant impacts on the availability of freshwater. It is estimated that hundreds of millions of people will face water shortage that will worsen as the global temperatures rise.

Climate Change and Energy

Our energy supply comes from burning fossil fuels like coal. We all know that burning fossil fuels causes emission of greenhouse gases into the atmosphere in turn causing climate change. We need to look at other sources of energy, Renewable energy like solar, wind are not only infinite in nature but are also environmentally friendly. Such sources of energy provide us with a safe option of energy generation through being environmentally sensitive.

We are the Change!

Finding Solutions to Climate Change

Objective

Climate change is perhaps one of the greatest threats being faced by humankind. However, we can still turn the clock around by tackling the threat of climate change through understanding and implementing the solutions to climate change.

Key Words

Renewable Energy, Emissions, Greenhouse gas, Energy

Content

As we are a part of the problem we are also a part of the solution! Everyone teachers, students, individuals, schools society has the ability to contribute to the solutions to climate change by driving change from oneself and then teaching others.

As a teacher you first need to “Connect the Dots” so that the future generation looks at environmental education as a moral responsibility and the right way to living.

1. Connect the Dots

The best approach to teaching children about climate change is through instilling a sense of connectedness to the environment. For e.g. you can take your students out and have a Tree Hugging Activity. By connecting the dots you will make the environmental issues personal and hence there will be a greater tendency on every individual’s part to tackle it.

2. Green way to School

Talk to the children about how transportation causes greenhouse gas emissions. You can tell them how they can reduce their greenhouse gas emission by biking, walking, public transportation or taking the bus to school. Lead by example and try green transport options for yourself. Discuss with students their experiences in getting to school more greenly. What was better?

3. Start a Zero-Waste-in-the-Classroom Policy

Your school can set up recycling bins and also audit how much rubbish is created in a day. You can challenge kids to pack zero-waste lunches by using reusable bottles, containers, and satchels, rather than disposable ones. Competing with another classroom to see who can reduce their

waste output most is a great way to create healthy competition and less waste.

4. Waste Segregation

You can also teach your children about waste segregation as this will help kids understand how much waste they are creating in a day, and where it's all coming from.

5. Grow a Garden

Teaching children to grow their own garden is an excellent approach to reconnecting with the environment. They may just plant a tree or some plant. Even a walk around school grounds will help teach about natural wonders.

6. Unplug

Emphasising on energy conservation tell students to switch off all electrical appliances when not in use. Students should be taught never to leave their computers and televisions on stand-by mode as it consumes the energy which otherwise could be saved for tomorrow.

7. Turn off Taps

Living in a metropolitan cities like Delhi the concept of water conservation is always important. Children should be reminded of how important water is for our lives and therefore they should be taught to conserve water in every possible way e.g. taking bucket bath, turning off tap while brushing etc.

8. Reuse, Reduce and Recycle

Have your children inculcate the habits of the 3 R’s. The best way to get around doing this is in their arts and craft class. Have students understand the value of waste by creating something out of waste. For e.g. you can make newspaper bags or recycled paper.

9. Renewable Energy

Talk to students about renewable energy. You could also plan a trip to Rajiv Gandhi Renewable Energy Garden to demonstrate to the students the importance of renewable energy.

Each one teach one!

1. Energy Efficient Appliances

Tell your students to encourage their parents to purchase energy efficient household appliances as it will save energy as well as money.

2. Cold water wash and dry line

Washing clothes in cold water instead of hot water and drying them outside in the fresh air and sunlight instead of drying them in the washing machine will reduces your machine's energy usage by 75% and also reduces the CO_2 emissions to a great extent.

3. Refrigeration

Keeping the refrigerator door open for longer duration than necessary or improper shutting of the refrigerator door will also raise the energy consumption, therefore, you must ensure that you shut the door tightly each time after you use the refrigerator.

4. Air Conditioning

Air conditioning should be used at an energy efficient temperature which will save energy as well as keep the room comfortable. This temperature set is 25 degree.

5. Lighting

Ask your parents to switch over to energy saver bulbs wherein you will obtain the same amount of light but save on energy bills as well as cut a lot of CO2 emissions.

6. Cook Smart

Ask your mother to cook smart! Use vessels of suitable size while cooking instead of using large sized vessels for cooking even small quantities of food. Always cover the utensil while cooking as it saves a lot of fuel.

7. Segregate Waste

Ask your parents to segregate all the waste produced in the house. The kitchen waste can be used as compost in the garden, they will prove to be excellent fertilizers.

8. Eat Local

Ask your mother to buy fresh vegetable and fruits from the local vegetable seller and not from the supermarkets. Fruits and vegetables comes to the supermarkets at a high transportation cost in turn adding CO2 into the atmosphere.

9. Say No to plastic

It is always better to carry a jute bag while shopping for vegetables. Students should encourage their mother to “Say no to plastic” and yes to jute bags!

Activity Three

Understanding Energy Conservation through Energy Audit

Purpose

This exercise will help students become aware about the energy consumption by different appliances. This awareness will help students to take measures to keep a check on wastage of electricity during their lifetime.

Time

60 minutes each for 1 week

Materials Required

Pen/Pencil and an observation chart

Purpose

This exercise will help students understand the importance of energy conservation. With the help of this exercise students will see and understand how energy is being inefficiently used in their homes and schools. For e.g. people turn on appliances and walk through rooms every day without a thought to where the electricity comes from, or how much they are using. The energy audit exercise will enable students to observe and see the real time benefits of energy conservation and efficiency. Students will understand that as environmentally conscious citizens, we must limit the amount of electricity we use in our daily life.
Process

- Identify the main electrical appliances in your home and or school.
- Find out the wattage of each appliance and the number of hours for which each appliance is used per day.
- Calculate the overall energy consumption for each electrical appliance for the whole month and then compare it with your monthly electricity bill.
- Then work out a plan to reduce your overall electricity consumption.
- Now calculate the overall energy consumption for each electrical appliance for the whole month and then compare it with the previous bills to see the changes.

How to calculate?

You can calculate the amount of energy consumed by using the below given formula:

(Wattage * Hours Used Per Day) / 1000 = Daily Kilowatt-Hour (kWh)

You may prepare your observation chart based on your findings, using the format provided below:

Electrical Appliance	Wattage of the Appliance	Number of Hours Used	Total Energy Consumed	Electricity Bill for the Month

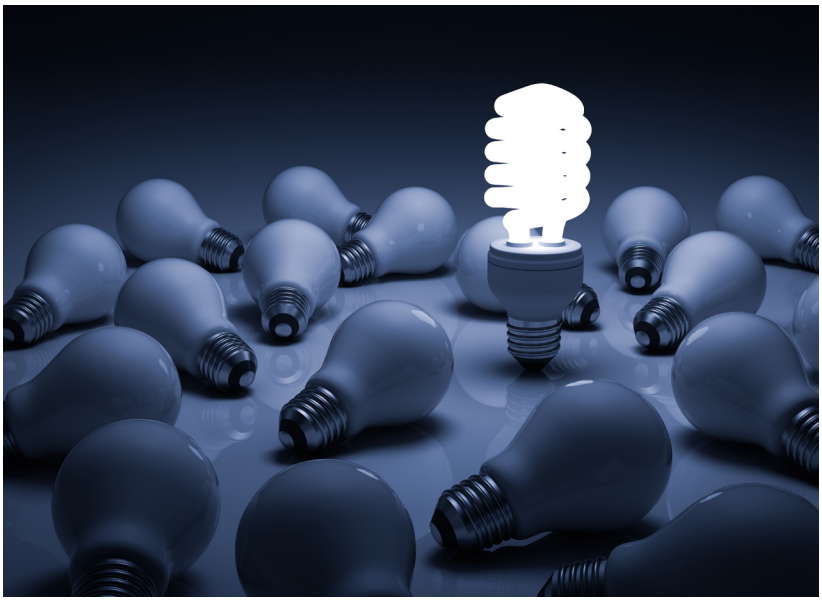
Notes

Every time you switch on an appliance you are emitting CO2 into the atmosphere. We need to be sensitive about the level of energy usage in their daily lives, and realize how over-consumption of energy negatively affects the environment. We should adopt ways to conserve energy by conducting regular energy audits in school and/or homes and finally make a transition to the various energy-saving measures in our daily lives.

Extension

Have students do the energy checklist in parts of your school building. Make a presentation to the Principal, Energy Manager and School Board about what they found and ways they could make the building more energy efficient.

Energy Audit – Learning to Conserve Energy for a Healthy Planet



As the world's population grows the need for energy has never been more important. Rapid development, new-age technologies, commercial-ization, population growth all have underpinned the demand for energy worldwide. While we cannot ignore the importance of

energy for our livelihood and well-being we must also not ignore the impacts of energy usage on our planet. It is therefore important to understand the need for energy conservation in our daily lives.

What is Energy Conservation?

Energy Conservation is a way of reducing energy consumption through using less of an energy service. Energy conservation differs from efficient energy use, which refers to using less energy for a constant service. For example, driving less and using public transport or carpooling is an example of energy conservation.

How can you conserve energy?

We can inculcate the habit of conserving energy into our daily routine by starting with little things as given below:

- Switch of lights when not in use.
- Switch off all electrical appliances when not in use.
- Purchase energy efficient appliances.
- Use public transport or car-pool.
- Reuse - Reduce – recycle wastes.

What is Energy Audit?

Energy Audit is a survey/analysis done to understand the energy flow and consumption in a particular building e.g. school/home. Energy Audit can help us device ways to conserve energy so that we contribute to a healthier planet as well as save on electricity bills.

How can we do Energy Audit?

Energy Audits are performed by calculating the energy consumption of an appliance for a given period of time. For e.g. if a 60 Watt bulb is turned on for one hour it will consume .06 units of energy.

(Wattage * Hours Used Per Day) / 1000 = Daily Kilowatt-Hour (kWh)

(60 *1) / 100 = .06 unit of energy.

What is the benefit of Energy Audits?

Energy Audit helps us in understanding how much energy we are consuming on a daily basis. If we do a comparative analysis of the practices we adopt before energy conservation and after energy conservation (for e.g. switching off lights when not in use as opposed to keeping lights on even when not in use) energy audit will help us gauge the difference in the energy consumed and the savings it will bring us along with benefits to our planet.

Activity Four

Let's Recycle Paper

Purpose

This exercise will help students become aware about the importance of recycling. This will be a good exercise for students to understand the transformation of waste material into a usable material.

Time

60 minutes each for 1 week

Materials Required

Waste paper from old notebooks/old newspaper/old magazines, a little starch, a bucket, a mortar and pestle or any other device to pound the paper, a wire mesh sieve or a perforated plate.

Purpose

This exercise will help students understand the importance of recycling. With the help of this exercise students will see and understand how we can re-use waste materials. Students will learn that to help conserve forests and to reduce the quantity of waste, it is imperative to reuse and recycle paper as much as possible.

Process:

1. Tear the paper you are using into small pieces.
2. Soak overnight in a bucket of warm water, with a little starch added to it.
3. In the morning, take out of the wet soggy paper from water and make a paste using mortar and pestle until it becomes soft and pulpy.
4. Add more starch to thicken it. Put this pulp over a wire mesh and allow the water to drip out.
5. Press a little to squeeze out the excess water. Now turn the sieve slowly upside down over a smooth surface and put some weight over it.
6. Once it dries up your hand-made paper is ready for use.

Notes

The teacher can discuss the importance of recycling and explain to the class how recycling reduces the amount of waste and helps in protecting the environment by reducing the need to cut large number of trees for manufacturing paper.

Extension

These articles prepared by using the rough recycled hand-made paper can be displayed during an Art & craft exhibition in your school

Let’s Recycle Paper

There are a lot of things that you can do to control global warming. Every little effort you make to prevent energy from being wasted in your home, school or at other places you visit, can help decrease the negative impacts of humans on the earth's climate. Each one of us can reduce our contribution to global warming by using less greenhouse-gas-producing energy sources: driving less, choosing fuel efficient vehicles and appliances (like refrigerators and water heaters), and using different forms of renewable energy (solar, wind thermal energy), which do not release carbon dioxide, wherever possible for our daily energy requirements like water and space heating.

What is Recycling?

Recycling is a process by which we use waste material/products to make new, useful materials/products. This is done to reduce the use of raw materials that would have been used otherwise. Recycling also uses less energy and it is a great way of controlling air, water and land pollution.

Impacts of Climate Change in India

Objectives

Understanding the impacts of Climate Change in India.

Keywords

Monsoon, climate change, population

The Indian economy is an agrarian economy i.e. an economy largely dependent on agriculture. India, today in the 21st century is faced with various stressors. For instance the boom in population growth is poised

to exert an enormous pressure on the already limited resources. Coupled with population growth is the impeding issue of impacts of climate change on the country. As resources are already under stress due to increasing population this situation will worsen with the effects of global warming and climate-related disasters. It is estimated that climate change

will have huge impacts in India affecting health, food security, availability of water and biodiversity. We are all aware of the extreme weather events in our country. Heat waves have taken the lives of over 2500 people.

Climate Change impacts on Monsoon

Monsoon in India play a very important role as the country depends on the monsoon to meet its agricultural and water needs, and also for protecting and propagating its rich biodiversity. Since the 1950's a decline in the monsoon rainfall have already been observed. The frequency of heavy rainfall events in some areas and extreme droughts in some areas have also increased. The total annual rainfall over India and is crucial for Indian agriculture, as a decline in the monsoon has been observed this could have a devastating effect on the Indian economy, and on food security.

Impacts on water resources

Many parts of India are already experiencing water stress. Due to an enormous population growth in the country even without climate change a satisfying demand for water will be a major challenge in the future. Many factors such as urbanization, population growth, agricultural demands, and climate change are like to aggravate the situation further. Increase in the erratic patterns of monsoon rainfall is expected to increase water shortages in some areas. Apart from the monsoons India is largely dependent on the water supply from its perennial rivers, which are continuously fed throughout the year by

the glacial melt-waters from the Hindukush and Himalayan ranges. But the Himalayan glaciers, which feed the major Indian rivers and support millions of livelihoods are rapidly shrinking due to climate change.

Effect on Agriculture

Agricultural productivity can be affected in two ways: one, directly, due to changes in temperature and monsoons, and indirectly, through changes in soil moisture and increase in the infestation by pests, insects, diseases or weeds due to favourable conditions. Higher mean temperatures increased evaporation and transpiration rates and with no rainfall to compensate, yields will be reduced. Agriculture will be adversely affected not only by an increase or decrease in the overall amounts of rainfall, but also by shifts in the timing of the rainfall.

Impact on Human Health

Climate change scientists suggest that a rise in temperature will adversely affect human health in India. Climate change will adversely affect the health of people through two ways. Firstly, higher temperatures will prove to be conducive for diseases causing mosquitoes. Increased temperatures can increase the range of vector borne diseases such as malaria, dengue fever, yellow fever. Diseases causing mosquitoes are now found in areas like Shimla where previously they were not there. The second impacts of climate change will be heat waves. More people will die due to heat waves. Heat stress could result in heat cramps, heat exhaustion, heat stroke etc.

Effect on Ecosystems and Biodiversity

As temperatures rise, species which cannot adapt will go extinct, while others will migrate to new locations under changing climatic conditions. One tenth of the world's known species of higher altitude plants and

animals occur in the Himalayas. Climate change is posing a serious threat to these species due to changing temperature. An example of climate change affect biodiversity is seen in the Sundarbans where due to sea level rise

Effect of Sea Level Rise on Coastal Low Lands

Sea-level rise due to climate change will put at risks coastal cities like Mumbai and Kolkata. It will also lead to saltwater intrusion in the coastal areas, impacting agriculture, degrading groundwater quality, contaminating drinking water, and possibly causing a rise in diarrhoea cases and cholera outbreaks, as the cholera bacterium survives longer in saline water.

Climate Change and Energy Security

As a country we now need to explore the renewable sources of energy such as solar, wind, hydroelectric power essentially because they are freely available, pollution free. The Indian economy today is largely dependent on coal to meet its energy needs. We now know that burning of coal releases the greenhouse gases which in turn causes climate change. Therefore we need to explore renewable sources of energy so that we can meet our energy needs as well as live in a pollution free world.

Top Ten Things you need to know about Climate Change!

1. Earth's average temperature has risen about 1 degree F in the past 100 years and is projected to rise another 3 to 10 degrees F in the next 100 years.

"This rise in temperature is unprecedented. Human activities have caused emissions of CO2 causing wide-scale climate change."

2. Global warming is caused primarily by carbon dioxide from burning coal, oil and gas.

"Carbon Dioxide is the main culprit of Global Warming. CO2 is released when fossil fuels are burnt in industries, power plants etc."

3. There is scientific consensus that global warming is real, is caused by human activities, and presents serious challenges.

"Climate change is one of the biggest challenges to be ever faced by humankind. Such scientific consensus can be seen from the reports published by scientists around the world (e.g. IPCC)."

4. There's a difference between weather and climate.

"Weather can change from hour-hour, day to day whereas climate is the long term average pattern of weather."

5. The ozone hole does not cause global warming.

"Ozone hole was caused by CFC's which were once used in refrigerators and air conditioners. CFC's are now banned."

6. Global warming will have significant impacts on people and nature.

"Human beings are an intricate part of nature. As the global climate changes, it is bound to have its impacts on us in terms of extreme weather, food security, availability of water, health risks."

7. Sea level has already risen due to warming and is projected to rise much more.

"Temperature rise will cause thermal expansion of water in oceans and seas as well as melting of the ice caps and glaciers."

8. Saving energy and developing alternative energy sources would help.

"Each of us can reduce our contribution to global warming by using less greenhouse-gas-producing energy: driving less, choosing fuel efficient cars and appliances. We as responsible citizens need to adopt and encourage the use of renewable sources of energy."

9. An international agreement known as the Kyoto Protocol has been negotiated to reduce greenhouse gas emissions.

"Kyoto Protocol was an agreement signed by most of the nations. This protocol calls for countries to reduce their CO2 emissions."

10. Protecting the world's climate by stabilizing atmospheric concentrations of greenhouse gases will require enormous reductions in current emissions.

"Renewable energy is the energy of the future. If adopted fully, the world will enough supply of energy sans pollution."

Sustainable Development Goals

"World leaders have an unprecedented opportunity this year to shift the world onto a path of inclusive, sustainable and resilient development" - Helen Clark, UNDP Administrator.

The concept of the SDGs was born at the United Nations Conference on Sustainable Development, Rio+20, in 2012. The objective was to produce a set of universally applicable goals that balances the three dimensions of sustainable development: environmental, social, and economic.

At the United Nations Sustainable Development Summit on 25 September 2015, world leaders adopted the 2030 Agenda for Sustainable Development, which includes a set of 17 Sustainable Development Goals (SDGs) to end poverty, fight inequality and injustice, and tackle climate change by 2030.

The Sustainable Development Goals (SDGs) are a new, universal set of goals, targets and indicators that UN member states will be expected to use to frame their agendas and political policies over the next 15 years. The Sustainable Development Goals follow and expand on the Millennium Development Goals that were formulated in 2001.

MDGs to SDGs

The SDGs build on the Millennium Development Goals that were adopted in 2000, enormous progress has been made, recognizing that more needs to be done. The SDGs have a more ambitious agenda for e.g. it seeks to eliminate rather than reduce poverty. The SDGs prove to be a rather breakthrough because the agenda recognizes issues that were not in the

MDGs such as climate change, sustainable consumption and innovation.

Goal number 13

- Take urgent action to combat climate change and its impacts.

Targets of Goal 13

- Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.
- Integrate climate change measures into national policies, strategies and planning.
- Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.
- Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible.
- Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities.

Climate Change

There is no country in the world that is not seeing first-hand the drastic effects of climate change. Greenhouse gas emissions continue to rise, and are now more than 50 percent higher than their 1990 level. Further, global warming is causing long-lasting changes to our climate system, which threatens irreversible consequences if we do not take action now. People are experiencing the significant impacts of climate change, which include changing weather patterns, rising sea level, and more extreme

weather events. The greenhouse gas emissions from human activities are driving climate change and continue to rise. They are now at their highest levels in history. Without action, the world's average surface temperature is projected to rise over the 21st century and is likely to surpass 3 degrees Celsius this century—with some areas of the world expected to warm even more. The poorest and most vulnerable people are being affected the most.

Facts & Figures

According to the Intergovernmental Panel on Climate Change we know that:

- From 1880 to 2012, average global temperature increased by 0.85°C. To put this into perspective, for each 1 degree of temperature increase, grain yields decline by about 5 per cent. Maize, wheat and other major crops have experienced significant yield reductions at the global level of 40 mega tonnes per year between 1981 and 2002 due to a warmer climate.
- Oceans have warmed, the amounts of snow and ice have diminished and sea level has risen. From 1901 to 2010, the global average sea level rose by 19 cm as oceans expanded due to warming and ice melted. The Arctic's sea ice extent has shrunk in every successive decade since 1979, with 1.07 million km² of ice loss every decade.
- Given current concentrations and on-going emissions of greenhouse gases, it is likely that by the end of this century, the increase in global temperature will exceed 1.5°C compared to 1850 to 1900 for all but one scenario.
- The world's oceans will warm and ice melt will continue. Average sea level rise is predicted as 24 – 30cm by 2065 and 40-63cm by 2100. Most aspects of climate change will persist for many centuries even if emissions are stopped.
- Global emissions of carbon dioxide (CO2) have increased by almost 50 per cent since 1990.
- Emissions grew more quickly between 2000 and 2010 than in each of the three previous decades.

- It is still possible, using a wide array of technological measures and changes in behaviour to limit the increase in global mean temperature to two degrees Celsius above pre-industrial levels.
- Major institutional and technological change will give a better than even chance that global warming will not exceed this threshold.

Climate Change & Development

Climate change and development goals cannot be pursued separately. Including climate change as an SDG finally has recognized their interrelatedness. "SDG Number 13: Take urgent action to combat climate change" highlights an important milestone as the issue was not addressed through the Millennium Development Goals (MDGs).

Climate change is already being observed globally with countries experiencing changes in rainfall, more flooding, droughts, intense rain and more frequent heat waves. A common responsibility falls on every one of us to protect the environment, recognizing the different impacts each one of us has on the environment and the planet. This responsibility should be extended to the future generations whose actions are imperative for the planet.

Activity Five

Understanding Sustainable Development

Purpose

To understand the concept of sustainable development

Group size

4 to 36 participants

Time needed

30 minutes

Materials

- A large number of white pebbles.
- A large number of red pebbles (or any contrasting color).
- An opaque bag for each community.

Directions

1. Divide the group into communities of four.
2. Place 16 white pebbles in an opaque bag for each community.
3. Give each community member a large handful of red pebbles.
4. Choose the most culturally appropriate scenario from the following five scenarios.

The scenario illustrates that by overusing a resource, that resource or another is damaged in some way. Share the scenario with the participants.

- White pebbles represent one parcel of land farmed; red pebbles represent use of chemical fertilizer, herbicide, and pesticide.
- White pebbles represent one parcel of land used to graze animals; red pebbles represent loss of grazing vegetation and over production of manure.

- White pebbles represent one day's catch from a fishing vessel; red pebbles represent population growth of less-desirable species.
- White pebbles represent travel by air; red pebbles represent exhaust pollution from airplanes.
- White pebbles represent products made from a factory; red pebbles represent pollution to air and water by that factory.

Explain the rules of the game:

- Participants draw one or more pebbles from the bag each turn.
- Each community member must draw at least 1 white pebble from the bag per round to survive. It does not matter how many red pebbles are drawn.
- If a participant does not draw a white pebble she/he "dies" and does not continue to play.
- Each community member may take as many pebbles as desired from the bag.
- At the end of each round, the white pebbles in each community's bag are counted; exactly that many white pebbles are added to the bag.

Rounds 1 and 2: First generation (the present). For each white pebble a participant takes, one red pebble is placed in the team's bag immediately.

Rounds 3 and 4: Second generation (your children). For each white pebble a participant takes, three red pebbles are placed in the bag immediately. Rounds 5 and 6: Third generation (your grandchildren). For each white pebble a participant takes, three red pebbles must be placed in the bag immediately.

Discuss how the game progressed

- Who had the advantage? Why?
- Why did participants take as many pebbles as they did?
- How did the actions of the first generation impact the third generation? Is this fair?
- During what round was the "fatal move" made (the act that caused the demise of the system?) How did this affect the rest of the game play?

Give the communities the chance to play again, without the bags, so that participants can monitor the communal resource and the pollution. The same rules apply.

Discuss how this game progressed.

- Were communities able to sustain the resource so that the third generation had as little pollution/overuse as the first generation?
- Did any communities opt to limit: use of chemicals/amount of grazing/ catch size/air travel/pollutants created?
- How much communication did it take to sustain the resource?

My Contribution!

Activity Snapshot

In this activity, students will understand their own contribution to environmental problems through an experiential exercise. They will measure their classroom garbage for one day and consider the impacts of this waste over a longer period of time. As a conclusion to the activity, students will produce posters to raise awareness of garbage produced in the school, in hopes of encouraging their peers to waste fewer resources.

Rationale:

Complex environmental issues can seem like problems without easy solutions. Ultimately, the resolutions to these issues lie in the decisions of regular people. Each North American produces about 4.5 pounds of garbage each day (which includes commercial waste produced on their behalf). This number could easily be cut in half if we each make more environmentally friendly choices, which would reduce the overall yearly landfill to half its current rate.

Objective:

- Students will draw a connection between their decisions and the amount of waste they produce

- As a class, students will produce guidelines for reducing garbage output in the future

Time: Three 60-minute periods

Materials: a bathroom scale, one day's worth of classroom garbage, garbage bags, latex or rubber gloves, black board, chart paper

Steps:

1. For the day prior to the lesson, have students deposit all their garbage (including lunch-time garbage) into one bin, container or bag. (Note: If students do not eat in their classrooms, designate a separate garbage can in the lunch room or cafeteria).
2. Begin the lesson by showing students the container filled by the previous day's garbage. Ask them to guess the weight of the garbage. Students can take turns picking up the container to estimate its weight.
3. Briefly discuss the idea of landfill with the class. Ensure that students understand where their garbage goes after is it collected. Share the 4.5 lbs. per day statistic with the class and explain the meaning of"commercial waste produced on their behalf"(materials that go into producing everything they consume).
4. In front of the class, weigh the garbage on a bathroom scale. Record the number on the black board. To make the weight easier to understand, compare it to other objects whose weight children might be familiar with. (Note: Remember to weigh the garbage can separately so the weight is not included in the number).
5. Multiply this number by seven to show students how much garbage their classroom would produce in one week (if they went to school on the weekends). Multiply the number by 365 to find out how much garbage they would produce in one year (if they went to school through the summer).

Activity Six

Learning Sustainability

Purpose

Open exploration of climate change/sustainability issues through use of key words

Time needed

30 minutes

Resources

Cue card set of key words relating to significant climate change/sustainability issues

Procedure

Distribute a sheet with a key word to each table. Ask participants to discuss and list the sustainability (environmental, social and economic) issues associated with their word. Once this is complete ask them:

- Are there any activities or actions being performed to redress the issues they have identified?
- Can they think of any other solutions to the problems they have identified?

Groups then report back to class on their findings/ideas and, if

necessary, discussion about harder or controversial issues (for example over population) can be facilitated with the whole group

It is important to guide discussion so that participants feel secure discussing and debating different points of view

Key Words

Energy, Waste, Water, Ecology, Population, Urbanization, Food, Pollution.

Activity Seven

Sustainability in Our daily lives

Purpose:

Encourages students to think about how sustainability issues are embedded in many day-to-day activities throughout a product's life cycle

Time:

20 minutes

Procedure

Choose an industry related activity that brings out the existence of environmental, social and economic issues, e.g. hospitality - making a cup of tea or coffee

- Ask students to think about the process of making tea or coffee in their household – what usually happens, from sourcing the ingredients to the end of their life.
- Ask them to think about how far the choice of ingredients normally takes account of the following things

Questions

- Where the tea or coffee came from and who was involved in its production, has it travelled a long distance, was it fair-trade, who picked the tea, coffee?

- Where the milk came from –milkman, supermarket, local farm, a central depot
- Where the sugar came from – distance travelled, amount of processing involved.

Understanding Project Activities

About Project Activities

The project activities are designed to give the students a chance to transform their understanding &knowledge of climate change into projects that would give them further insights into the impacts of climate change on certain resources. We have identified six such natural resources/domains where students can delve in further to understand the current status and the various threats imposed by climate change under the guidance of their teachers.

The six domains identified are follows:

- Energy.
- Water.
- Biodiversity.
- Air.
- Health.
- Waste.

To maintain standardization and to keep the project activity light and less cumbersome we have developed a standard methodology in which the project must flow. The methodology is as follows:

A global view– Here a students need to take a bird eyes view of the resources globally. He/she need to get an understanding about the

resource in a global context.

A local view– After the student has got a glimpse of the global status of the resource he/she would need to trickle down his understanding at a local level. This would require him to understand where he/she gets his/her his resource (e.g. energy, water) from.

Understanding the impacts of climate change on the resource– Once the students has an understanding about the resource at a global as well as local level he/she would need to identify the threats faced by that resource particularly in the context of climate change. He/she would need to garner knowledge/information on how climate change has impacted or is impacting the resource.

Solutions– We have now reached the end of the pipe where students can now look for solutions to the various threats of climate change that they have identified. Here students can research on existing solutions or come up with innovation solutions on their own

Example –

International Scenario for Health

- How is climate change related to health? Introduction to the various health concerns with respect to climate change.
- In what way has climate change affected the temperate regions of the world? In what way has climate change affected the tropical regions of the world?
- How much percentage of deaths is there globally due to heat waves?
- Is there a migration of diseases towards the colder regions around the globe? How much is the trend increasing?
- List the top 10 cities or countries affected maximum by climate change related health issues.

National Scenario of Health

- How has climate change contributed to heat waves? Which parts of

India are most affected?
- How much has the mortality rate increased due to heat waves?
- How are the colder regions of the country being affected by climate change? In terms of introduction of parasites and other insects.
- How is climate change contributing to the growth and thriving of mosquitoes in India?

Local Scenario of Health

- Have the instances of heat waves increased? How does it affect your daily life?
- Have the instances of disease increased in your locality?

Solutions

- How best do you think we can combat climate change and its impacts on health?
- How can we prevent instances of heat waves or rain events in our own little way?

Guidelines for doing the project activity

Here is a possible approach that you could use to help students do the project activity:

1. Introduce yourself to all the six domains and find out which one of them interests you the most.
2. Do some background research about the topic you have chosen. Build your background and tap your existing knowledge about the topic.
3. There are many researches already done on all of the above mentioned domains. So here you should be careful with what you are reading. Make sure you are reading the latest reports with the latest facts and figures.
4. As you keep going keep recording your thinking, jotting down key points and questions that might arise in your minds.
5. You will be reading a lot of the already existing knowledge bank for

information gathering. Always keep a note of the paper, article or website that you pick information from so that you can go back to it should you need more clarity.

What will be achieve by doing the project activity?

Reading for perspective The project activity will enable students read a wide range texts to build an understanding, to acquire new information; to gain insights of the status of resources and respond to the challenges.
Reading strategies Students apply a wide range of strategies to comprehend, interpret, evaluate, and collect information.
Communication skills The project activity will help students make use of their spoken and written skills to communicate effectively.
Application of knowledge The project will help students apply their existing knowledge together with the knowledge they gain from reading other materials into writing and communicating.
Research skills The project activity will enhance their research skills and interests. It will help them generate ideas and questions. Students conduct research on issues and interests by generating ideas and questions.
Culmination of information Students will learn the art of information culmination and sorting of information to develop an outcome.
Leadership skills Students will be presenting their project activity work to an audience hence this will help them develop presentation and leadership skills.

Project Activities Guidelines

As the project activities will be centred on 6 domains: Water, Air, Biodiversity, Energy, Health and Waste we are providing a guidelines for potential points of discussions in the classroom as well as activities that could be performed.

Water

Objective

- To generate awareness on water resources.
- To make students understand the importance of fresh water.
- To inform the students about the threats to water resources.
- Understanding the local scenario; how do we get water in our pipes?
- To explain the relationship between water and climate change.
- Understanding the solutions to water management & conservation.

Points for Discussion

- Understanding water cycle and the status of the global water resources.
- Talk about various sources of water in India.
- Discuss the impacts of climate change on global and national water scenario.
- Discuss aquatic ecosystem, our dependence on it, and causes of concern like

pollution, siltation, and depletion.
- Discuss water conservation measures and focus on the importance of various water-harvesting mechanisms.
- Highlight the relationship of water and climate change.

Activities

- Prepare a map showing rivers and freshwater lakes of India.
- Students can be given assignments on topics like “Water and Climate Change”, “Water and Me” etc.
- Students should be given individual assignments to prepare an essay on water issues, including the concept of the 3Rs (reduce, reuse, recycle).
- Undertake school-based water conservation initiatives such as water recycling and rainwater harvesting.
- Students are now able to recognize places in India that have suffered from such crises in recent times and write assignments on it.

Outcome

- Students are aware of the concerns related to water—floods, droughts, and so on.
- They are aware of various anthropogenic and natural causes that are threatening water resources, and also about the impact of climate change on water availability with respect to glacial melt/sea-level rise.
- They are capable of taking steps to save water whenever and wherever possible at their level.

Biodiversity

Objective

- Introduce students to the global biodiversity and its various components.
- Sensitize them to the fragility of

the biodiversity.
- Make them aware about biodiversity, its functioning, and threats.
- Introduce them to the vast biodiversity of India.
- Explain how biodiversity and climate change are interlinked.
- Discuss the impacts of climate change on biodiversity and the threats associated with it.

Discussion

- Students should learn about various bio-geographic zones of India.
- They should be taken on an exposure about neighbouring forest, greenbelt or river bank to acquaint them on various ecosystems like aquatic and terrestrial.
- The teacher should brief the students about the adverse effects of climate change on biodiversity and preventive mechanisms to avoid further damage.
- Also talk about various biodiversity conservation measures.

Activities

- Students can be given a project to write about the different types of forests, the biodiversity in each, and the climate zones they fall under. They can write about their understanding of the relationship between the climate and the vegetation and then list conservation measures. There should then be a classroom discussion on the reasons why some the ecosystems are threatened and why they should be protected.
- Students to collect photos/pictures of various ecosystems and write about the threats of climate change being faced by them.
- Students should be asked to write essays explaining reasons for preserving biodiversity and also describe most convincing arguments to garner awareness and support.

Outcome

- Students can now define biodiversity with special reference to India's rich and diverse natural resources.
- They can relate the importance of biological diversity with our

existence.
- They are aware of the threats to biodiversity.
- They can initiate conservation activities.

Energy

Objective

- To develop an understanding of the potential of renewable energy.
- To generate an understanding of the percentage of renewable energy tapped worldwide.
- To understand the renewable energy potential and status of our country.
- To understand our consumption patterns and their relevance to sustainable living.
- To comprehend various measures to conserve energy at household level.

Discussion

- Teachers should brief the students about renewable energy potential and usage around the world.
- Initiate discussion on the renewable energy potential of our country.
- Discuss simple maintenance or actions that can lead to greater efficiency of appliances and eventual reduction in electricity consumption.
- Discuss energy-efficient home lighting systems and other household electric gadgets (refrigerator, fans, television, and so on).
- Understanding of star rating and various methods that could be employed to reduce energy usage.

Activities

- Students should be asked to study the various methods of generating electricity and find out which of these is non-polluting.
- Students should be asked to do a research on the renewable energy potential of the country.
- Students can be asked to check the energy labels of various appliances at home and make notes on differences in bills.
- Students can be asked to collect information about techniques and maintenance methods that can increase the efficiency of any household gadgets/ electrical appliances at home.

Outcome

- Students will now have a fair knowledge of renewable energy globally vis-à-vis nationally.
- Students now recognize the amount of electricity consumed by the various gadgets used at home.
- Recognize simple methods that can be applied while using the gadgets that can lead to greater efficiency and reduction in our bills.
- Realize the importance of replacing old appliances with ones having new technology.
- The students will get to know simple home tips for using various appliances, to reduce monthly bills at home.

Human Health

Objective

- To introduce the subject of health concerns with special reference to climate change to the students.
- Give the students an understanding of health issues with respect to climate change globally.
- Understanding the problem of air pollution globally and further narrowing it down to India.

- To make the students understand the problems of air pollution in particular, as it is one of the major causes of climate change.
- To impart knowledge on the impact of various air pollutant on health.
- To understand and practice the precautionary measures available.

Discussion

- Talk about health issues pertaining to climate change at a global level.
- Talk about the rising incidences of health issues due to climate change.
- Discuss the causes of air pollution and its prevention mechanisms.
- Discuss the quality of air in their city and their observation regarding the air quality in their area.
- The teacher can bring out the importance of individual and collective initiatives to reduce pollutant emissions in the air.

Activities

- Students be asked to make an assignment on the rising levels of health issues pertaining to climate change globally. They should be made to list the top 10 cities or countries affected maximum by climate change related health issues.
- Students should make an assignment on the impacts of climate change related health issues in rural India.
- Study should also have an understanding of air pollution impacts in their local areas and list down stores from local people living in their community.

Outcome

- Students are now well aware about various aspects of human health and its relation with climate change.
- Students can now initiate action to prevent health anomalies caused by change in the climate.
- Charged with knowledge students will change their lifestyle, thereby minimizing chances of contributing to further degradation.

Waste Management

Objective

- Environment-friendly waste management techniques.
- Waste segregation and its importance.
- Waste disposal methods.
- Understand the role of the rag pickers (kabadi walah) in recycling waste material.
- Ways and means of waste minimization in daily life.

Discussion

- Understanding waste flow globally and nationally.
- Discuss the concept and importance of waste segregation, and explain how it is done.
- Highlight the importance of 'Reduce, Reuse, Recycle, and Responsibility'. Discuss the waste minimization methods you can adopt in school and at home.
- Discuss the benefits of recycling and the role played by the kabadi walah in waste management.
- Discuss in detail the linkages between waste and climate change.
- Discuss how our daily activities can contribute to waste generation with examples.

Activities

- Students can make an assignment on the "Cradle to Grave Approach" this will give them an understanding of the life cycle of a certain product or item.
- Comparative Analysis Task: Students can be asked to make a list of waste items they generate during in a day, from morning till night—food, clothes, travel, paper, and other items. They can list

down how much waste they produce and then have a discussion with other students in their classroom with focus on how they can avoid or lessen the waste they generate.

- Students should be sensitized about waste segregation. They should start the initiative of having two bins for use in their classrooms and homes. They should write down the importance of waste segregation present it in the school assembly for all to learn and practice.
- Students can also make a list of all the things that can be reused. They can then make a list of all the items that they reuse and make a presentation to their class.
- Ask them to check at home how often waste products like empty plastic or glass bottles, newspaper and tin boxes are sold to the rag picker. They should talk to the rag picker on his next visit and list all the waste items he accepts and what he does with it.

Outcome

- Awareness on growing concern over waste management globally and nationally.
- Students now recognize the differences between biodegradable and non-biodegradable waste.
- They have knowledge about the environment-efficient waste management techniques.
- They are aware about various waste minimization methods.
- They know the linkages between waste management system and cleaner environment.
- Better understanding on the issue will lead to some action and at least the students will be now cautious enough to segregate, reduce, reuse, and recycle waste.