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**Project Report**

**Climate**

**Change**

**In**

**India**

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# ***Project Report***



## ***Climate Change In India***

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

The Earth is the only planet in our solar system that is known to support life. The complex process of evolution occurred on Earth only because of some unique environmental conditions that were present: WATER, AN OXYGEN-RICH ATMOSPHERE, AND A SUITABLE SURFACE TEMPERATURE. Only the Earth has an atmosphere of the proper depth and chemical composition. About 30% of incoming energy from the sun is reflected back to space while the rest reaches the earth, warming the air, oceans, and land, and maintaining an average surface temperature of about 15 °C. The chemical composition of the atmosphere is also responsible for nurturing life on our planet. Most of it is nitrogen (78%); about 21% is oxygen, which all forms of life need to survive; and only a small percentage (0.036%) is made up of carbon dioxide which plants require for photosynthesis. The Earth's climate system constantly adjusts so as to maintain a balance between the energy that reaches it from the sun and the energy that goes from Earth back to space.

# Causes for Climate Change:

There are two types of causes

A) UNCONTROLABLE

B) CONTROLABLE

## A) UNCONTROLABLE CAUSES

### 1) Climate Forcing

The Earth's climate changes when the amount of energy stored by the climate\_system is varied. The most significant changes occur when the global energy\_balance between incoming energy from the Sun and outgoing heat from the Earth is upset. In recent times, the latter has been evident as a consequence not of natural processes but of man-made pollution, through emissions of greenhouse\_gases. By altering the global energy balance, such mechanisms "force" the climate to change. Consequently, scientists call them "climate forcing" mechanisms.



### 2) Earth's Orbit

. The original Milankovitch theory identifies three types of variation in the Earth's orbit around the Sun which could act as mechanisms to change the global climate. These include changes in the tilt of the Earth's axis (obliquity), changes in the shape of Earth's orbit (eccentricity) and the shifting of the equinoxes (precession). Each variation has its specific time. The three orbital variations together affect the total amount of sunlight received by the Earth, and distribution of that sunlight

### 3) Sun

For many years scientists have speculated that changes in the amount of energy given off by the Sun can influence the Earth's climate. The total solar energy received by the Earth, or solar constant, has only been measured accurately since the advent of the satellite era, 40 years ago.



#### 4) Atmosphere

The Earth has an atmosphere, consisting mostly of nitrogen (78%), oxygen (21%) and a number of greenhouse\_gases, which affect the balance of light and ultraviolet energy coming from the Sun and heat energy leaving the Earth. . The greenhouse gases, including carbon dioxide, methane, nitrous oxide and water vapor, absorb energy at some wavelengths. , but allow energy at other wavelengths to pass through unhampered. . This heats up the Earth's surface, causing it to re-release energy back to the atmosphere. The lower wavelength heat (or infrared) energy given off by the Earth, however, is mostly trapped (absorbed) by the greenhouse gases, and is prevented from escaping directly back into space. This trapped heat warms the Earth's surface on average by as much as 33°C. The process is called the natural\_greenhouse\_effect, and without it, the Earth would be as cold as the moon, about -18°C.



#### 5) Volcanoes

Atmospheric pollution from major volcanic eruptions can influence the global climate over one to two years. Explosive volcanic eruptions can inject large quantities of dust and sulphur dioxide, in gaseous form. Volcanic pollution results in a 5 to 10% reduction in direct sunlight, largely through scattering as a result of the highly reflective sulphuric acid aerosols. It is possible the longer term changes in the amount of volcanic activity on the Earth may explain incidences of longer term climate change during Earth History.



#### 6) Mountains

The mountain uplift exposed greater volumes of rock to the effects of chemical and physical weathering. During chemical weathering, carbon dioxide dissolved in rainwater helps decompose rock minerals to form bicarbonates. These bicarbonates are soluble and are transported via

rivers downstream to the coasts where they are deposited on ocean floors as sediment. This locks away the carbon dioxide for millions of years, thereby

reducing the amount of carbon dioxide remaining in the atmosphere. Since carbon dioxide is a greenhouse\_gas, increased rates of mountain building can diminish the strength of the Earth's natural\_greenhouse\_effect, contributing to global cooling.

## **B) CONTROLABLE**

### **1) Greenhouse Gases**

Despite their relative scarcity, the so-called greenhouse gases play an important role in the regulation of the Earth's energy\_balance. Greenhouse gases in the atmosphere trap infrared heat energy trying to escape back to space. In doing so they raise the temperature of the lower atmosphere and the Earth's surface in contact with it. This warming process is called the natural\_greenhouse\_effect, but during the last 200 years, mankind's pollution of the atmosphere with extra greenhouse gases has enhanced this natural greenhouse effect that may be contributing to global\_warming. Greenhouse gases include any gas in the atmosphere that is capable, as a result of its particular molecular structure, of absorbing infrared radiation or heat. They are called greenhouse gases. Natural Greenhouse gases include water vapor or moisture, carbon dioxide, methane, nitrous oxide and even ozone, which is more commonly associated with the ozone layer and ultraviolet radiation. The amounts of all these gases in the atmosphere are now being increased as a result of man-made processes, such as fossil fuel burning and deforestation. The atmospheric concentration of carbon dioxide, for example, has increased by 30% since the 18<sup>th</sup> century.

In addition to the man-made increase of naturally occurring greenhouse gases, mankind has released some completely new chemicals into the atmosphere, including the CFCs or these have now been banned in an attempt to save the ozone layer, they will remain in the atmosphere for at least another 50 years chlorofluorocarbons. . Furthermore, their replacements, the HCFCs (hydrochlorofluorocarbons) and HFCs (hydrofluorocarbons), whilst being relatively harmless to the ozone layer, are equally potent greenhouse gases, and at present their phase-out dates are not due for another 20 to 30 years.

# MEASURES

## INDIA'S INITIATIVE

### Sectoral Initiatives—

#### **Coal:**

**Coal is and will remain the mainstay of commercial energy production. To ensure more efficient use of coal the following have been taken:**

-Participation of private sector encouraged in increasing efficiency.

-Technology upgradation—involving: coal washing, improvements in combustion technology and the recovery of methane

#### **OIL:**

**To promote fuel efficiency and conservation, the following measures have been undertaken:**

-Reduction of gas flaring.

-Installation of waste heat recovery systems.

-Equipment upgradation.

-Substitution of diesel with natural gas in city transport.

-Establishment of Petroleum Conservation Research Association, to increase awareness and develop fuel efficient equipment.

#### **GAS:**

**This source of energy is the preferred substitute for coal and oil**

-In the residential sector, gas has replaced coal and kerosene, LPG in bottles and LNG in pipes.

-CNG is being introduced as an alternative to petrol and diesel in the transport sector.

-Major investments have been made in developing infrastructure for long distance and local distribution.

-Import options are under consideration.

### **Hydropower:**

**The government's policy objective is to exploit the huge potential in India's northeast. At present, about 25% of the total installed electricity generation capacity is accounted for by hydro.**

### Renewable

India has a very active programme to promote the use of renewable energy. Some salient features of the current renewable situation are given source wise.

#### Solar

-Photovoltaic systems based on solar energy have been put to a variety of uses in rural electrification, microwave repeater etc....

-A 140 MW integrated solar combined cycle has been set up based on solar thermal technology and liquefied natural gas.

-Solar lanterns, home and street lighting system, and pumping systems are being promoted.

#### Wind Energy

-India is among the five leading nations in wind power generation.

-The installed capacity is 1507MW, and generators of capacity 250-600 kW are manufactured here.

-95% of installed wind power capacity is in the private sector. Wind turbine equipment is also being exported to other developing and developed countries.

#### Biogas

- Biomass power generation plant of total capacity of about 358 MW has been installed.
- In rural areas, over 3.2 million bio gas plants and 33 million improved stoves has been installed.

### **Energy efficiency and conservation**

**India is alive to the importance of improving the efficiency of energy usage and conservation measures.**

**A Bureau of Energy (BEE) has been setup to put into operation, conservation measures such as energy standards, labeling of equipments, building energy codes, and energy audits.**

### **Transport**

**A major initiative has been the up gradation of vehicular emission norms. A major norm called "Bharat 2000" has been implemented throughout the country on 1April 2000, for all categories of vehicles manufactured in India.**

- Awareness and Training programmes have been undertaken to educate drivers.
- The commercial manufacture of battery-operated vehicles has begun in India. This will promote low/no carbon emitting vehicles. For example: Reva car & YO bikes.
- In Delhi, large scale switching has taken place from petrol and diesel to compressed natural gas (CNG) with over 50,000 vehicles already been converted.

### **Industry**

**Government policies, campaigns by associations of industry and strategic decisions by firms have all contributed to sizeable improvements in the intensity of energy use in industries.**

- Measures to improve energy efficiency include:
  1. Promotion of fuel efficient practices and equipments.
  2. Replacement of old and inefficient boilers and other oil operated equipments.
  3. Fuel switching and technology upgradation.

### **Agriculture**

**Some efforts to mitigate climate change in the agricultural sector have also undertaken. They are:**

- Standardization of fuel efficient pump sets, pumps energized by solar energy.
- Rationalization of power tariffs.
- Better cultivation practices which will help in reducing N<sub>2</sub>O emissions.

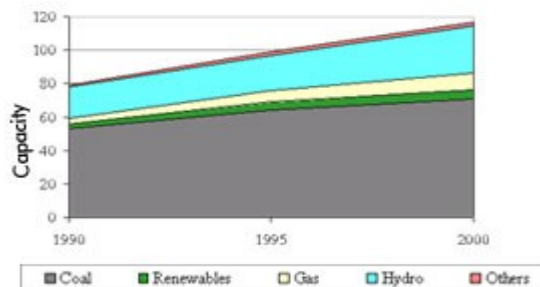
### **Residential**

Fuel efficient equipment such as kerosene and LPG stoves, compact fluorescent lamps, pumps for lifting water in high rise building are being promoted in the residential sector.

### **Power Sector**

India has a diverse mix of power generation technologies with coal dominating the mix and a significant contribution by large hydro.

The gas in the power capacity has increased from 2% in 1990 to 6% in 2000.



- Power sector reforms include regulatory restructuring, privatization and unbundling of state owned utilities.
- Corporatization is altering state electricity boards from state ownership & administration to business like corporation.
- the Indian Electricity act of 1910 and the Electricity act of 1948 have been amended to permit private participation in generation and distribution of power.

### **Afforestation and Land Restoration**

- The basic measures include protecting existing forests, putting a check on the diversion of forest land for non-forestry purposes, encouraging farm forestry and private area plantation.

- The National Afforestation and Eco-development Board is responsible for regenerating degraded forest land, land adjoining forests and ecologically fragile areas.

## **What We Can Do:**

Climate change may be a big problem, but there are many little things we can do to make a difference. If we try, most of us can do our part to reduce the amount of greenhouse gases that we put into the atmosphere.

### **Read**

Learning about the environment is very important. There are many good books that will help you learn. . You also can look at the Links page to find other good web sites with information about the environment and climate change. You can also look for sites of NGOs which work for environment like NATURE FOUNDATION (INDIA). Also help children know about nature in fun ways like birdhouse.

### **Save Electricity**

Whenever we use electricity, we help put greenhouse gases into the air. By turning off lights, the television, and the computer when you are through with them, you can help a lot.

### **Bike, Bus, and Walk**

You can save energy by sometimes taking the bus, riding a bike, or walking.

### **Talk to Your Family and Friends**

Talk with your family and friends about climate change. Let them know what you've learned.

### **Plant Trees**

Planting trees is fun and a great way to reduce greenhouse gases. Trees absorb carbon dioxide, a greenhouse gas, from the air.

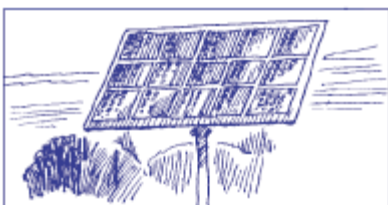


Cars, stereos, and VCRs can be 'energy smart'



The "recycle" symbol.

The "ENERGY STAR" symbol



Solar Panels such as these can provide electricity to buildings

## **Recycle**

**Recycle cans, bottles, plastic bags, and newspapers. When you recycle, you send less trash to the landfill and you help save natural**

**resources, like trees, oil, and elements such as aluminum. And also use cotton bags in place of plastic bags.**

## **When You Buy, Buy Cool Stuff**

**There are lots of ways we can improve the environment. One of the ways to reduce the amount of greenhouse gases that we put into the air is to buy products that don't use as much energy. Some products – like certain cars and stereos – are made specially to save energy.**

## **Some Things to Think About**

**Buy recyclable products instead of non-recyclable ones. 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.**

## **Solar Energy**

**. Solar energy is a fancy way of saying "energy that comes from the sun." Solar energy can be used to heat homes, buildings, water, and to make electricity.**

## **Cars**

**Cars cause pollution and release a lot of greenhouse gases into the air. Fortunately, there are some cars that are better for the environment like Reva car and YO bikes. These cars can travel longer on a smaller amount of gasoline. They don't pollute as much, either. Using these kinds of cars can help reduce the amount of greenhouse gases in the air.**

## **Bureau of Energy Efficiency (BEE)**

**Many things, like computers, TVs, stereos, and VCRs, refrigerator have special labels on them. The label shows a total of five stars. These represent energy efficiency of an equipment, the more the number of stars the more the appliance is energy efficient.**

# **ALARMING....**

## **Environmental Pollution:**

The environmental problems are growing rapidly. The growing population has put a strain on the environment, infrastructure, and the country's resources. Overexploitation of the country's resources, be it land or water and the industrialization process has resulted in considerable environmental degradation of resources.

## **Air Pollution:**

**Vehicle emissions** are responsible for 70% of the country's air pollution. Air pollution from vehicle exhaust and industry is a worsening problem for India. Exhaust from vehicles has increased eight-fold over levels of twenty years ago; industrial pollution has risen four times over the same period. The economy has grown two and a half times over the past two decades but pollution control and civil services have not kept pace. Air quality has become worst in the big cities.

The effects of air pollution are obvious:

1-rice crop yields in southern India are falling.

2-the brilliant white of the famous Taj Mahal is slowly fading to a sickly yellow.

## **River Water Pollution:**

Fully 80 percent of urban waste in India ends up in the country's rivers, and unchecked urban growth across the country combined with poor government oversight means the problem is only getting worse. A growing number of bodies of water in India are unfit for human use. **The frothy brew is so glaring that it can be viewed on Google Earth.** Samples taken recently from the Ganges River near Varanasi show that levels of fecal coliform, a dangerous bacterium that comes from untreated sewage, were some 3,000 percent higher than what is considered safe for bathing.

## **Ground Water Exploitation:**

Groundwater exploitation is a serious matter of concern today and legislations and policy measures taken till date, by the state governments (water is a state subject) have not had the desired effect on the situation.

## **Plastic Pollution:**

Plastic bags, plastic thin sheets and plastic waste is also a major source of pollution.

## **Municipal Solid Waste:**

Municipal solid waste is solid waste generated by households, commercial establishments and offices and does not include the industrial or agricultural waste. Municipal solid waste management is more of an administrative and institutional mechanism failure problem rather than a technological one.

## **Pollution due to Mining:**

With the annual growth of mining at 10.7 per cent and 500-odd mines awaiting approval of the Centre, the pollution would increase manifold in the coming years. The inhabitants have, however, been compromising by taking contaminated and sometimes polluted water, as there is no alternative source of safe drinking water. Thus, a sizeable populace suffers from water borne diseases. Besides mining, coal based industries like coal washeries, coke oven plants, coal fired thermal power plants, steel plants and other related industries in the region also greatly impart towards degradation of the environmental equality and the human health.

## **Greenhouse Gas Emission:**

India emits the fifth most carbon of any country in the world. Going forward, carbon emissions are forecast to grow 3.2% per annum until 2020. All inhabitants of our planet have an equal right to the atmosphere, but the industrialized countries have greatly exceeded their fair, per-capita share of the planet's atmospheric resources and have induced climate change. The most industrialized countries are mainly responsible for causing climate change. Thus equity requires that they should sharply reduce their emissions in order to arrest further climate change and allow other countries access to their fair share of atmospheric resources in order to develop.

## **NASA Research Findings:**

. The unique combination of meteorology, landscape, and the large population maximize the effects of aerosol pollution in India. Accumulation of aerosol particles in the atmosphere also makes clouds last longer without releasing rain. This is because atmospheric water forms deposits on naturally occurring particles, like dust, to form

clouds. But if there is pollution in the atmosphere, the water has to deposit on more particles. Thus it causes lesser rain.

## **Environmental Pollution and Chronic Diseases:**

. "The WHO estimates that 24 per cent of global disease burden and 23 per cent of all deaths can be attributed to environmental factors. The burden is more on the developing than the developed countries." The major burden of these hazards is borne by the lungs. Bronchial asthma and other allergies; chronic obstructive lung disease, respiratory infections including tuberculosis and occupational lung diseases are some of the common problems with a strong environmental risk which, account for a large disease burden all over the world, including in India. "

### **Reduce Pollution:**

- Reduce tax on incomes and institute a tax on pollution.
- The more carbon dioxide one emits the more he pays in taxes,"
- Tulsi ayurveda wisdom to help Taj Mahal retain its pristine allure. The public-private joint venture is expected to provide an eco-protection cover to sensitive Taj trapezium zone surrounding the 17th century monument as well as the other two world heritage monuments -- Agra Fort and Aitma-ud-Daula tomb. Tulsi (*Occinum sanctum*) chosen for its anti-pollutant anti-oxidation and air-purifying properties making it an ideal ornamental shrub in the vicinity of the Taj Mahal and help in making the air around pollution free.

## ***Webliography***

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