



**JECRC Foundation**

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE



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AND RESEARCH CENTRE

**Year & Sem. – IV Year (VII Sem.)**

**Subject – Power Generation Sources (7EE6-60.2)**

**Unit – 1**

**Topic: Effects of Energy Utilization on the  
Environment**

# VISSION AND MISSION OF INSTITUTE

## **Vision:**

To become a renowned center of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities.

## **Mission:**

M1: Focus on evaluation of learning outcomes and motivate students to inculcate research aptitude by project based learning.

M2: Identify, based on informed perception of Indian, regional and global needs, areas of focus and provide platform to gain knowledge and solutions.

M3: Offer opportunities for interaction between academia and industry.

M4: Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

# VISSION AND MISSION OF DEPARTMENT

## **Vision:**

The Mechanical Engineering Department strives to be recognized globally for excellent technical knowledge and to produce quality human resource, which can manage the advance technologies and contribute to society through entrepreneurship and leadership.

## **Mission:**

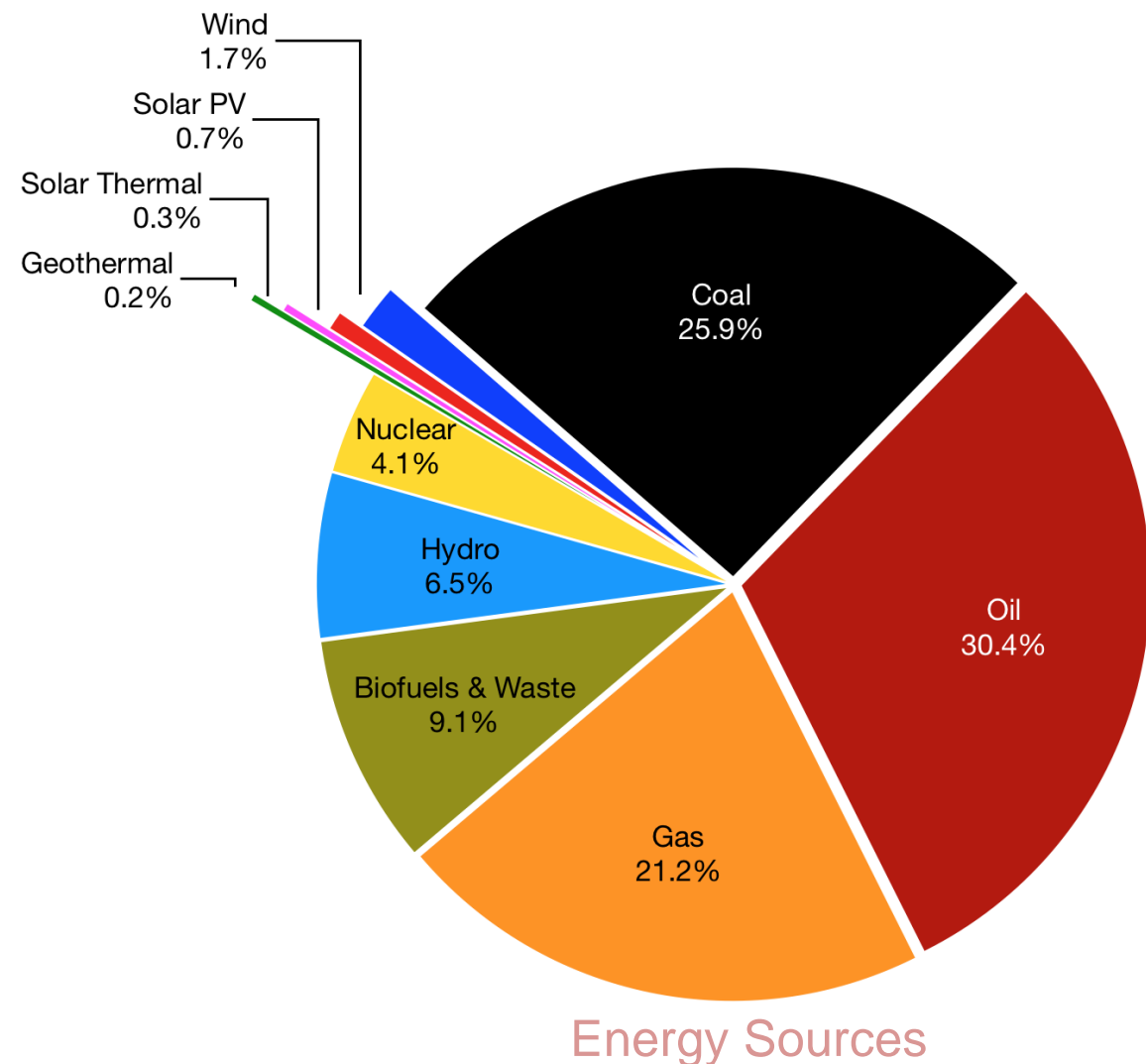
M1: To impart highest quality technical knowledge to the learners to make them globally competitive mechanical engineers.

M2: To provide the learners ethical guidelines along with excellent academic environment for a long productive career.

M3: To promote industry-institute linkage.

# INTRODUCTION

Most people in developing countries burn wood and charcoal to heat their dwellings and cook their food. Many of these individuals face fuel wood shortage that is expected to worsen because of unsustainable harvesting of fuel wood. About 2 million people die prematurely each year from breathing particles emitted by burning wood indoors on open fire and in poorly designed stoves.



## Effects on Environments

1. Global Warming
2. Green House effect
3. Climate Change
  - Smog effect
  - Deterioration of fields
  - Biodiversity
  - Extinction of animal species
  - Respiratory health problems
  - Sea Level Rise

.....And many more

# Non-Renewable Resources: PETROLEUM / CRUDE OIL

Petroleum or crude oil consisting of hundreds of combustible hydrocarbons along with small amounts of sulfur, oxygen, and nitrogen impurities.

- ❑ **Refining petroleum creates air pollution:** Transforming crude oil into petrochemicals releases toxins into the atmosphere that are dangerous for human and ecosystem health.
- ❑ **Oil spills cause great environmental damage:** In the process of drilling and transporting the oil around the World, some oil spills on land and on aquatic environment, thereby causing land, air and water pollutions
- ❑ **Burning gasoline releases CO<sub>2</sub>:** crude oil or any carbon-containing fossil fuel is that it releases CO<sub>2</sub> into the atmosphere thereby promoting climate change from global warming. Burning oil mostly as gasoline and diesel fuel for transportation accounts for 43% of global CO<sub>2</sub> emission





# Non-Renewable Resources: **NATURAL GAS**

- ❑ Natural gas is a relatively clean-burning fuel source — **Natural gas** emits 50 to 60 percent less carbon dioxide (CO<sub>2</sub>) that coal burning produces — so demand for natural gas has increased in the last few decades as concerns grow about carbon emissions and global warming.
- ❑ Companies use a method of *hydraulic fracturing, or fracking* to release the gas from the rocks and capture it for use as fuel.
- ❑ The sand and chemicals are left behind in the rock fractures, leading to groundwater pollution and potentially less stable bedrock.
- ❑ Currently scientists are concerned that earthquakes in regions of the Midwestern United States that have never experienced earthquakes before are the result of wastewater from natural gas fracking operations.

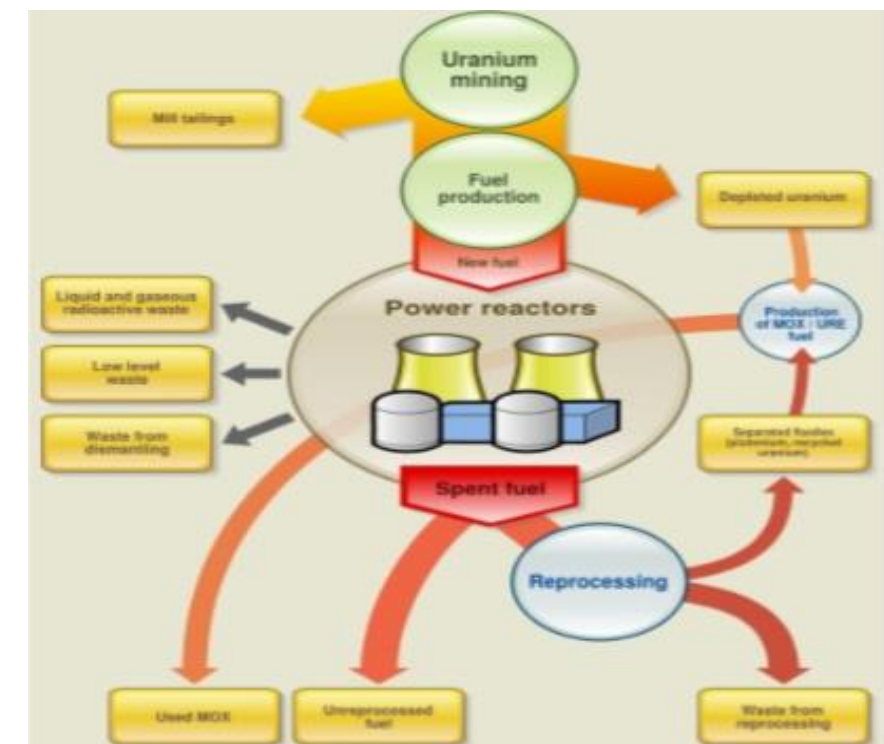
# Non-Renewable Resources: COAL

- ❑ Coal supplies over one-third of global electricity generation and plays a crucial role in industries such as iron and steel.
- ❑ Coal is composed primarily of carbon along with variable quantities of other elements, chiefly **hydrogen, sulfur, oxygen, and nitrogen**
- ❑ When **coal** is burned it releases a number of airborne toxins and **pollutants**. They include mercury, lead, sulfur dioxide, nitrogen oxides, particulates, and various other heavy metals.
- ❑ Coal-fired power plants produce more than 100 million tons of coal ash *every year*. More than half of that waste ends up in ponds, lakes, landfills, and other sites where, over time, it can contaminate waterways and drinking water supplies.
- ❑ Other impacts are:
  - Acid rock drainage from coal mines
  - Obliteration of mountain by mountain top removal mining
  - Energy-water collisions



# Non-Renewable Resources: **NUCLEAR ENERGY**

- ❑ Nuclear Energy has the smallest impact on environment. It is the only energy source to successfully and safely contain its own waste.
- ❑ Nuclear energy contributes a very small amount of emissions into the atmosphere which can cause many environmental problems such as global warming. Uranium is not burned in a nuclear power plant as **coal** is so there are no emissions from it
- ❑ The presence of radioactive material necessitates processes that are occupationally dangerous, and hazardous to the natural environment
- ❑ The worst accidents at nuclear power plants have resulted in severe environmental contamination
  - **Fukushima disaster**
  - **Chernobyl disaster**
  - **SL-1 meltdown**



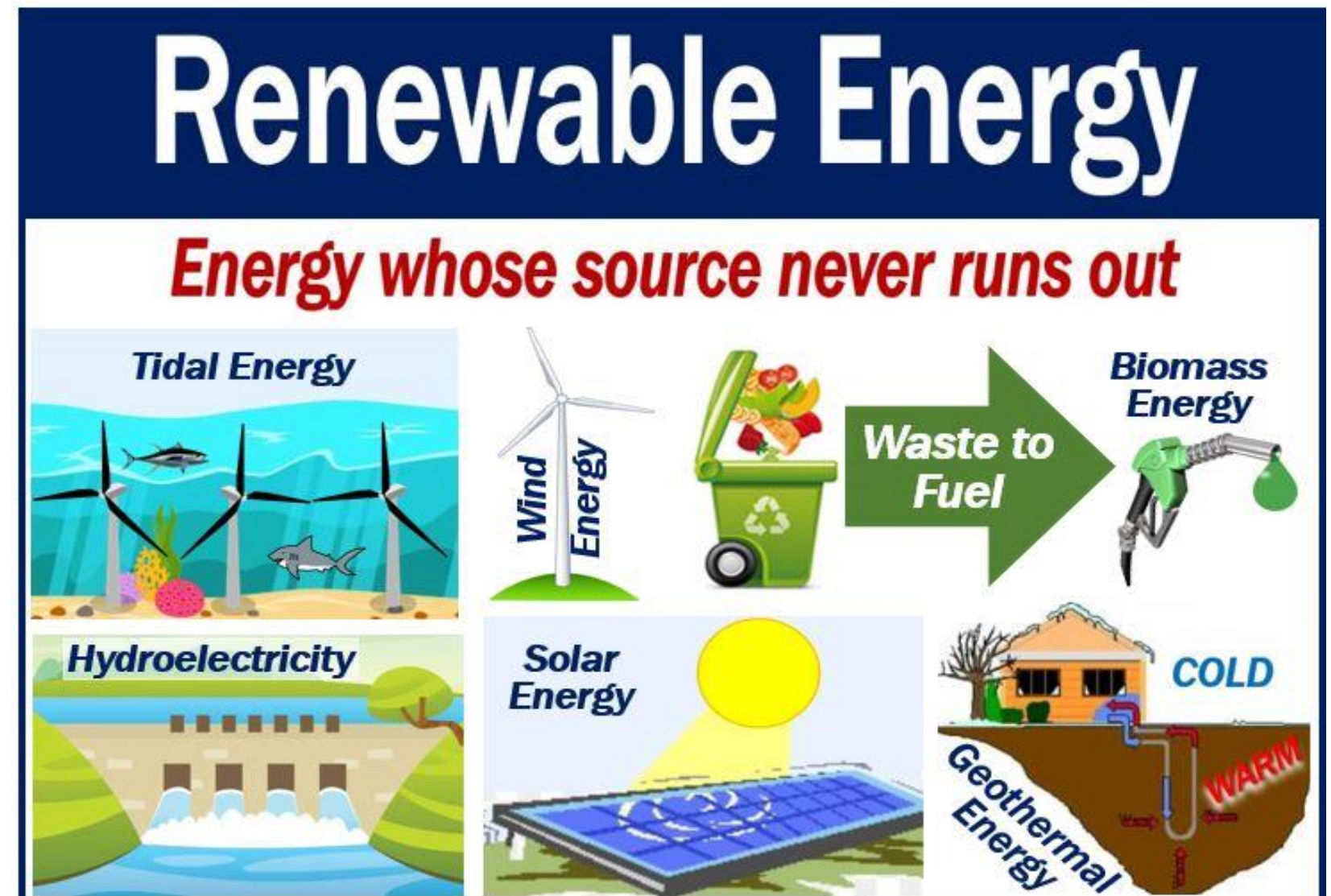


# Renewable Resources: SOLAR, WIND, GEOTHERMAL etc.

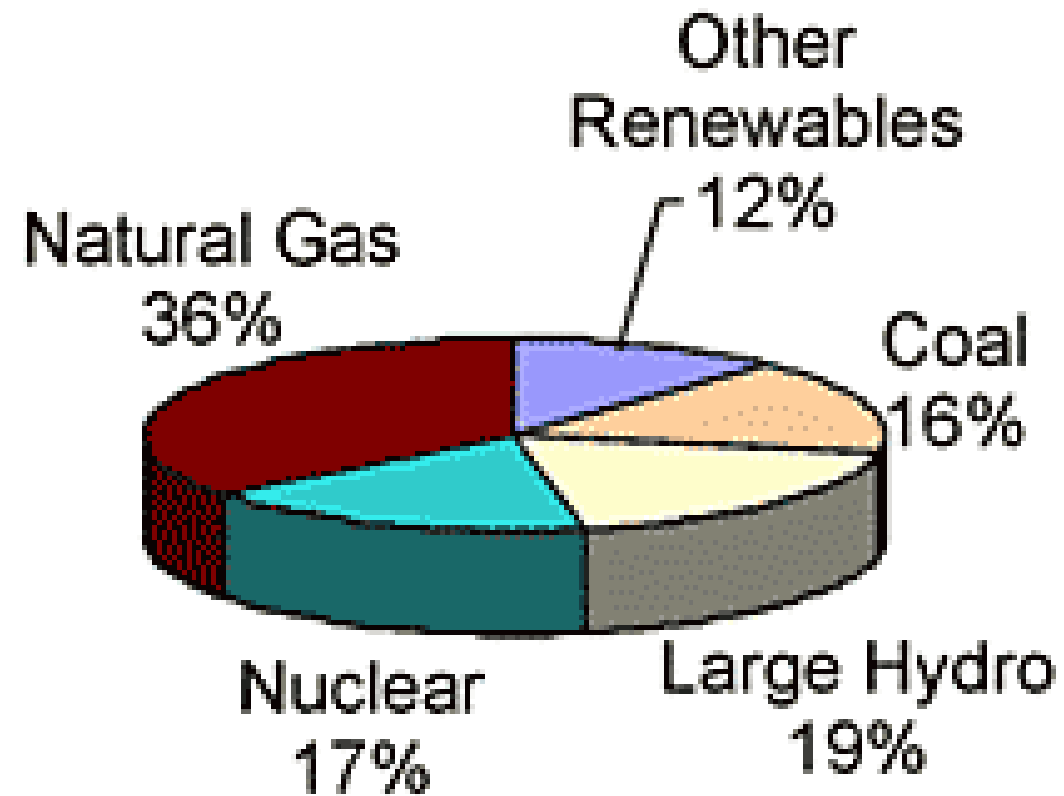
Renewable Energy Resources do not produce air pollution, water pollution, or greenhouse gases. renewable energy resources are otherwise called sustainable energy.

The major environmental impacts are :

- The use of land.
- The use of water.
- The use of natural resources.
- The use of hazardous materials
- Auditable noise form wind turbines

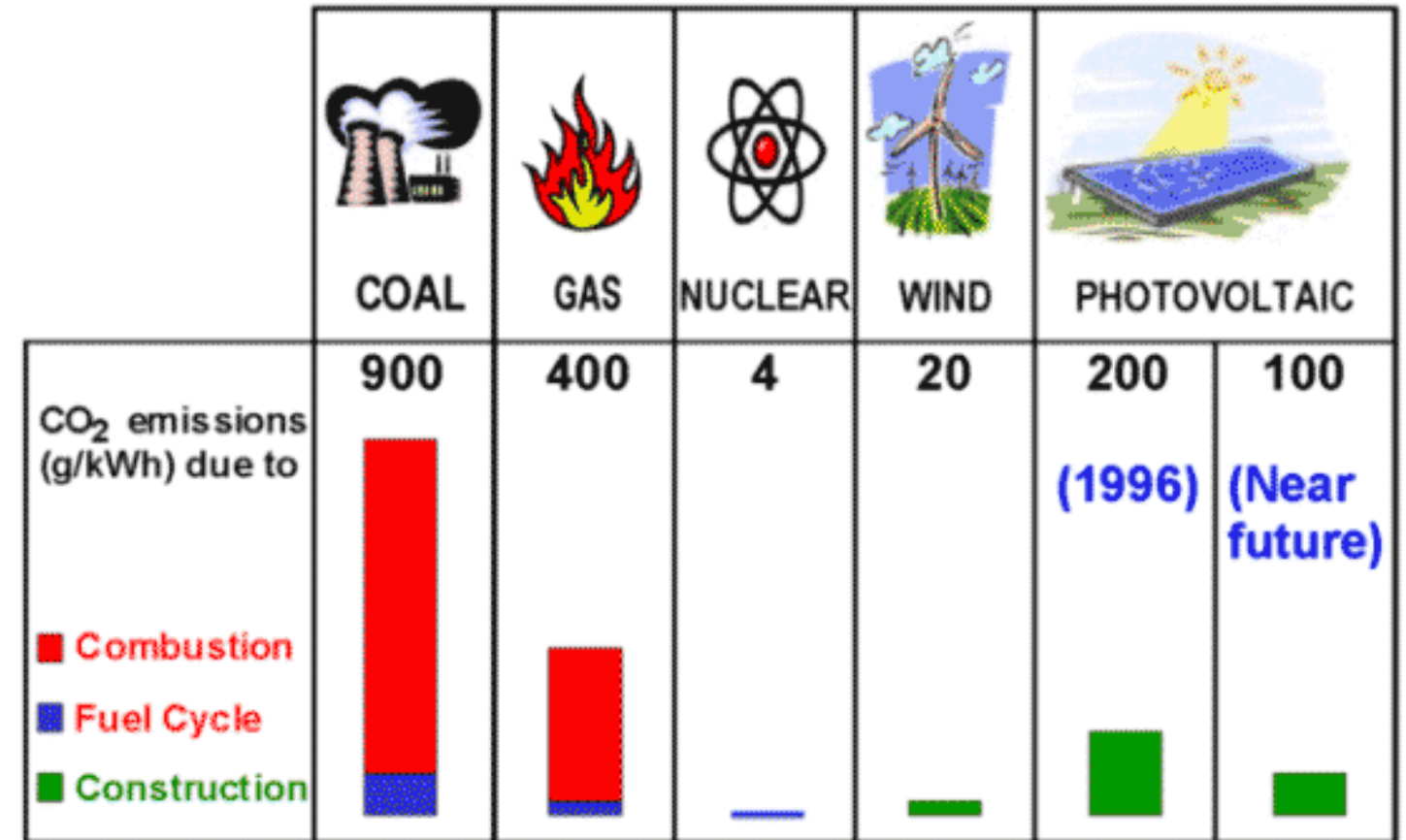


# Renewable Resources v/s Non-Renewable Resources



Other renewables = geothermal (4.6%), small hydro (3%), wind (2%), biomass & waste (2%), solar (0.4%)

CO<sub>2</sub> Emissions Related to Electricity Generation



CO<sub>2</sub> emissions per kilowatt-hour related to electricity generation

# Environmental Impact: GREENHOUSE GASES

Greenhouse gases are those that absorb and emit infrared radiation in the wavelength range emitted by Earth. Carbon dioxide (0.04%), nitrous oxide, methane and ozone are trace gases that account for almost one tenth of 1% of Earth's atmosphere and have an appreciable greenhouse effect.

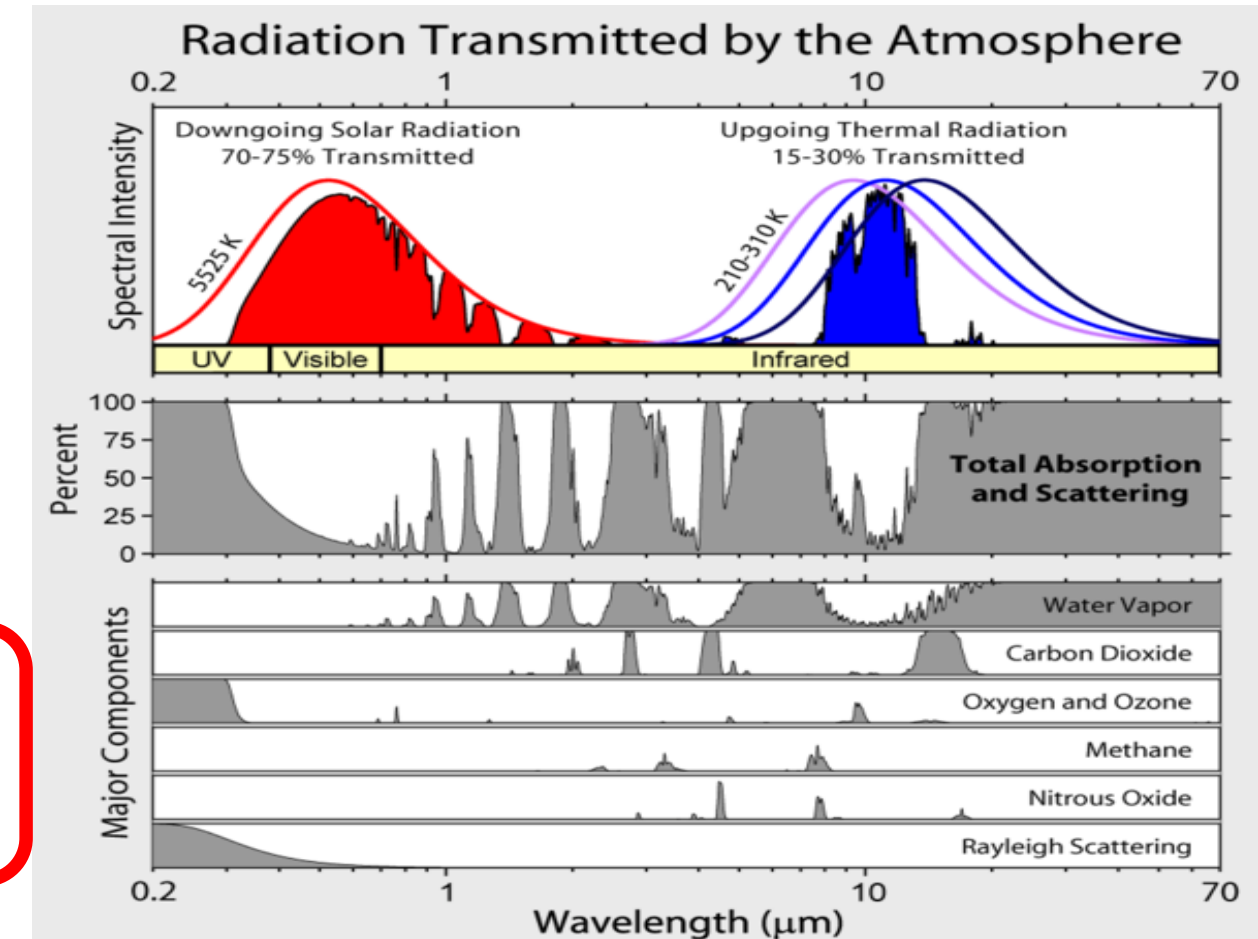
## Greenhouse Gases

- Water Vapor- Largest Contributor
- Carbon dioxide (CO<sub>2</sub>)
- Methane (CH<sub>4</sub>)
- Nitrous oxide (N<sub>2</sub>O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF<sub>6</sub>)

## Figure shows

**Middle:** Absorption bands in the Earth's atmosphere  
**Top:** Effect of Bands on both solar radiation and upgoing thermal radiation  
**Lower:** Individual absorption spectrum for major greenhouse gases plus Rayleigh scattering

Collectively these processes capture and redistribute 25-30% of the energy in direct sunlight passing through the atmosphere. By contrast, the greenhouse gases capture 70-85% of the energy in upgoing thermal radiation emitted from the Earth surface



**Airborne Fraction (AF):** The airborne fraction is a scaling factor defined as the ratio of the annual increase in atmospheric CO<sub>2</sub> to the CO<sub>2</sub> emissions from anthropogenic sources. It represents the proportion of human emitted CO<sub>2</sub> that remains in the atmosphere.

**The fraction averages about 45%, meaning that approximately half the human-emitted CO<sub>2</sub> is absorbed by ocean and land surfaces.**

**Global Warming Potential (GWP):** is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO<sub>2</sub>).



# Environmental Impact: CLIMATE CHANGE

Melting Glaciers



Flooding



Supercell Storms



Rising Sea Levels



Worsening Droughts



Increasing Tornadoes



Agriculture



Health



Species and Natural Areas





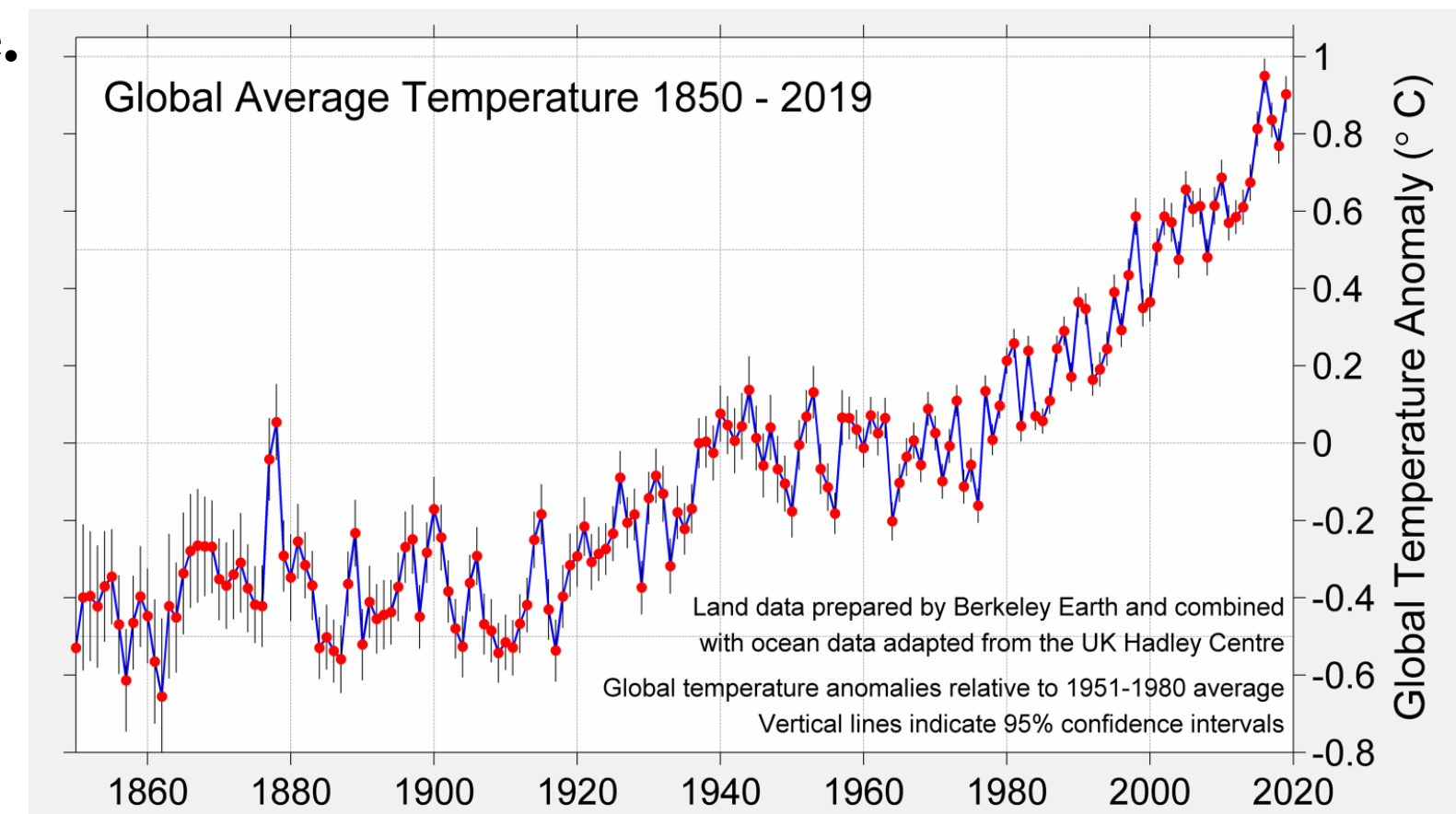
# Climate Change : GLOBAL IMPACTS -FACTS

The impacts of climate change are not evenly distributed – the poorest countries and people will suffer earliest and most. And if and when the damages appear it will be too late to reverse the process. Thus we are forced to look a long way ahead

- ❑ The Lewis Glacier, the largest on Mt Kenya, has decreased by 90% in volume since 1934, with the highest rates of ice volume loss occurring around the turn of the century
- ❑ Average sea levels have swelled over 8 inches (about 23 cm) since 1880, with about three of those inches gained in the last 25 years. Every year, the sea rises another .13 inches (3.2 mm).
- ❑ The concentration of carbon dioxide in the atmosphere hit a record 416 ppm, as of May 2020, is the highest in human history.
- ❑ 2016 was the warmest and 2019 was the second warmest year ever recorded.
- ❑ Eleven percent of all global greenhouse gas emissions caused by humans are due to deforestation.
- ❑ According to WRI research, 30 percent of global forest cover has been cleared, while another 20 percent has been degraded.
- ❑ Roughly 3.2 billion people are currently impacted by land degradation worldwide.
- ❑ The thickness of Sea ice in the Arctic has decreased dramatically by 40% since the late 1970s.
- ❑ The Baltimore oriole is shifting northward and may soon disappear entirely from the Baltimore area.
- ❑ Polar bear populations are coming under threat as food becomes harder to hunt.

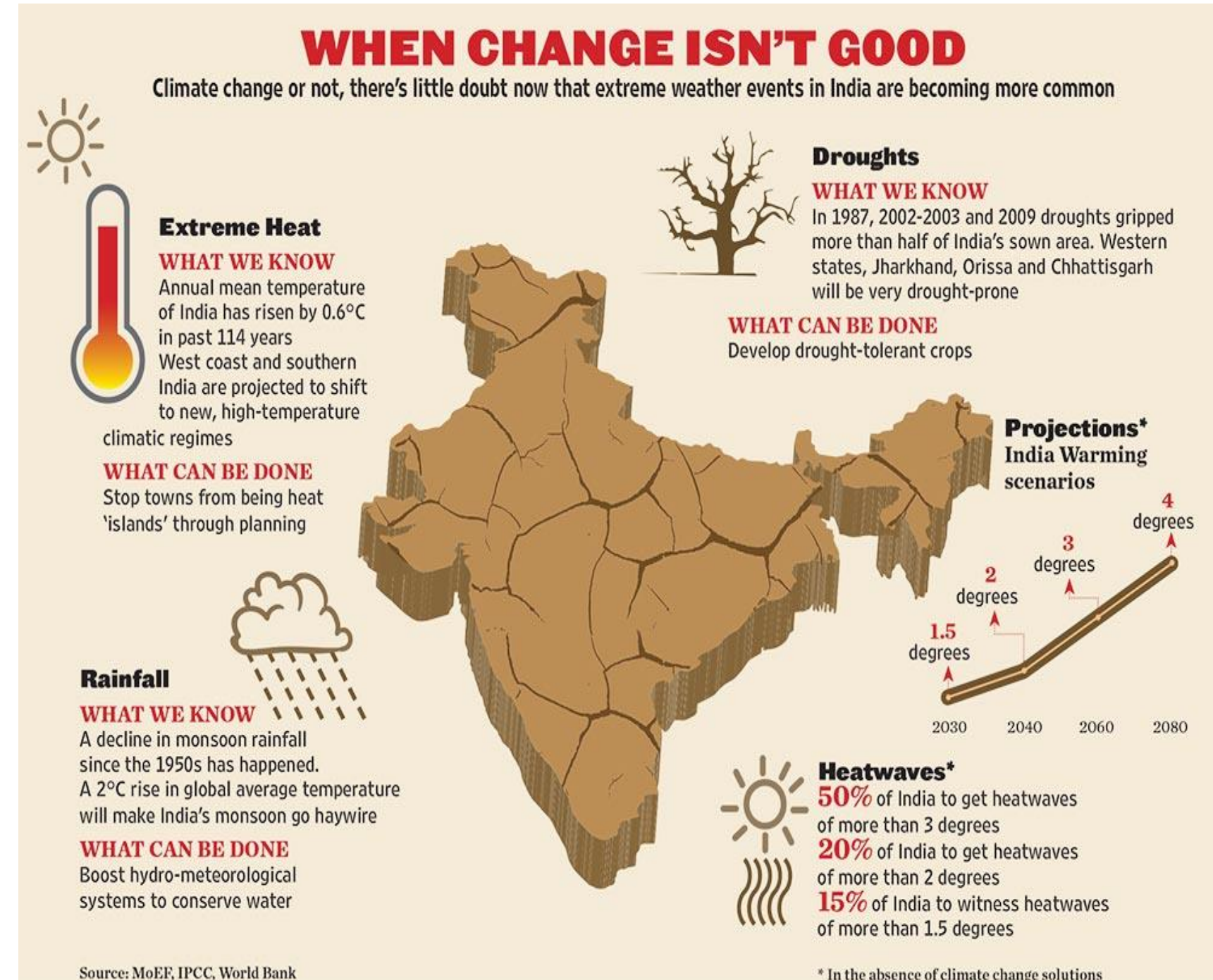
# Climate Change : Global Impacts -Facts

- ❑ Global warming is the increase in the average measured temperature of the Earth's near-surface air and oceans since the mid-20th century, and its projected continuation
- ❑ The global land and ocean surface temperature for January 2020 was the highest in the 141-year record.
- ❑ Earth's average global temperature has risen by **0.8 degrees Celsius** or **1.4 degrees Fahrenheit** since 1880: **NASA's Goddard institute.**



# Climate Change : IMPACT IN INDIA

- ❑ Northwest India - Reduction in rice yield
- ❑ Rajasthan - Drought
- ❑ Rann of Kutch - sea level rise
- ❑ Mumbai - Salt water intrusion
- ❑ Kerala - Productivity of Forest
- ❑ Tamil Nadu - Coral bleaching
- ❑ Ganges - Sedimentation problem
- ❑ Sunderbans - Sea level raise





# Case Study 1 - EFFECT ON APPLE CULTIVATION

- ❑ **Kullu Valley ( Himachal Pradesh) :** Experienced a number of crop failures in the last 15 years.
- ❑ Apple belt has moved 30 kilometers [northwards] over the last 50 years.
- ❑ Apple growers, says attributed poor production to reduced snowfall and its changed timing.
- ❑ Shift in Agriculture.
- ❑ Forest resources were removed.





## Case Study 2 - GANGA UNDER THREAT FROM WARMING

- ❑ Himalayan source of the Ganga is drying up at a rate of 40 yards a year, nearly twice as fast as two decades ago, and that some of these glaciers might disappear by 2030.
- ❑ In the dry summer months, the Gangotri glacier provides up to 70 percent of the water of the Ganga.
- ❑ According to a UN climate report, the shrinking glaciers also threaten Asia's supply of fresh water.



## Case Study 3 - IMPACT ON COASTAL ORISSA

- ❑ **The Satavaya region**, once a cluster of seven villages. Only two out of the seven villages exist, the other five villages have been submerged.
- ❑ The Coastal villages have been affected by cyclone and floods killing more than 30,000 people.
- ❑ The sea has ingresses to about 1.5 km into Satavaya and 2.5 km into Kanakpur.
- ❑ Satavaya has also lost 56% of its mangrove vegetation

## Assignment -3

- Q.1. What is black carbon and how does it cause global warming?
- Q.2 What is climate change? Is it different than global warming?
- Q.3 What does climate change have to do with spreading disease?
- Q.4 What is a carbon footprint and how can I reduce my carbon footprint?
- Q.5 What is the India doing to combat climate change?



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*Thank  
you!*