Presentation

By

Dr. V.P.JAUHARI, IAS.

CLIMATE CHANGE

Climate Change

- Climate change reflects abnormal variation to impact climate and subsequent affect on other parts of the earth, such as in the ice capes over duration ranging from decades to millions of years.
- In recent usage climate change usually refers to changes in modern climate or global warming.
- Since industrial revolution began about 150 years ago, human activities have added significant quantities of green house gases to the atmosphere. This could lead to greater warming which in turn can impact accelerated climate change.

Climate Change

- Between pre-industrial period and 2005, global atmospheric concentration of Carbon dioxide, Methane or Nitrous oxide have increased from 280 ppm to 379 ppm, 715 ppb to 1774 ppb and 270 ppb to 309 ppb respectively (IPCC 2007).
- IPCC Report 2007 predicts global temperature raise by 2 - 4.5^{o}C by the end of this century.

UN, IPCC REPORT,SEPTEMBER 2013 HIGHLIGHTS

- Climate Scientist are now 95% confident that humans are responsible for atleast half increase in global average surface temperatures since the 1950's. They were 90% confident in 2007 & 66% confident in 2001 of the same conclusion.

- CO_2 concentration in last 20,000 years along with increase in other emissions have driven up average temperature by about 0.6 degree celsius since 1950. Worst case predictions are that by 2100, temperatures could increase by as much as 2.7 degree celsius.
- Extreme weather conditions are on increase with studied direct link with the climate change such as july 2012 heat wave in north eastern and north central united states, spring heat wave in eastern united states, the great planes drought, the winter drought in spain & portugal and heavy rains and flodding in europe.

- In India in 2013 the uttaharakhand cloud bust killing thiusands of people is yet another example of extreme weather condition.
- Even if we succeed in ending emission tommorrow, climate change could continue for centuries.
- The last 30 year period is very likely the warmest in the last 800 years.

Background

- Burning of fossil fuels is a major source of industrial greenhouse gas emissions, especially for power, cement, steel, textile, fertilizer and many other industries which rely on fossil fuels (coal, electricity derived from coal, natural gas and oil).
- The major greenhouse gases emitted by these industries are carbon dioxide, methane, nitrous, nitrous oxide, hydro fluorocarbons etc, all of which have not yet been completely proven to increase the atmosphere's ability to trap infrared energy and thus affect the climate.
- The concept of carbon credits came into existence as a result of increasing awareness of the need for controlling emissions.

CLIMATE CHANGE

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Rapid Industrial Growth

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Increased energy consumption

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Increased CO2 and other GHG emissions

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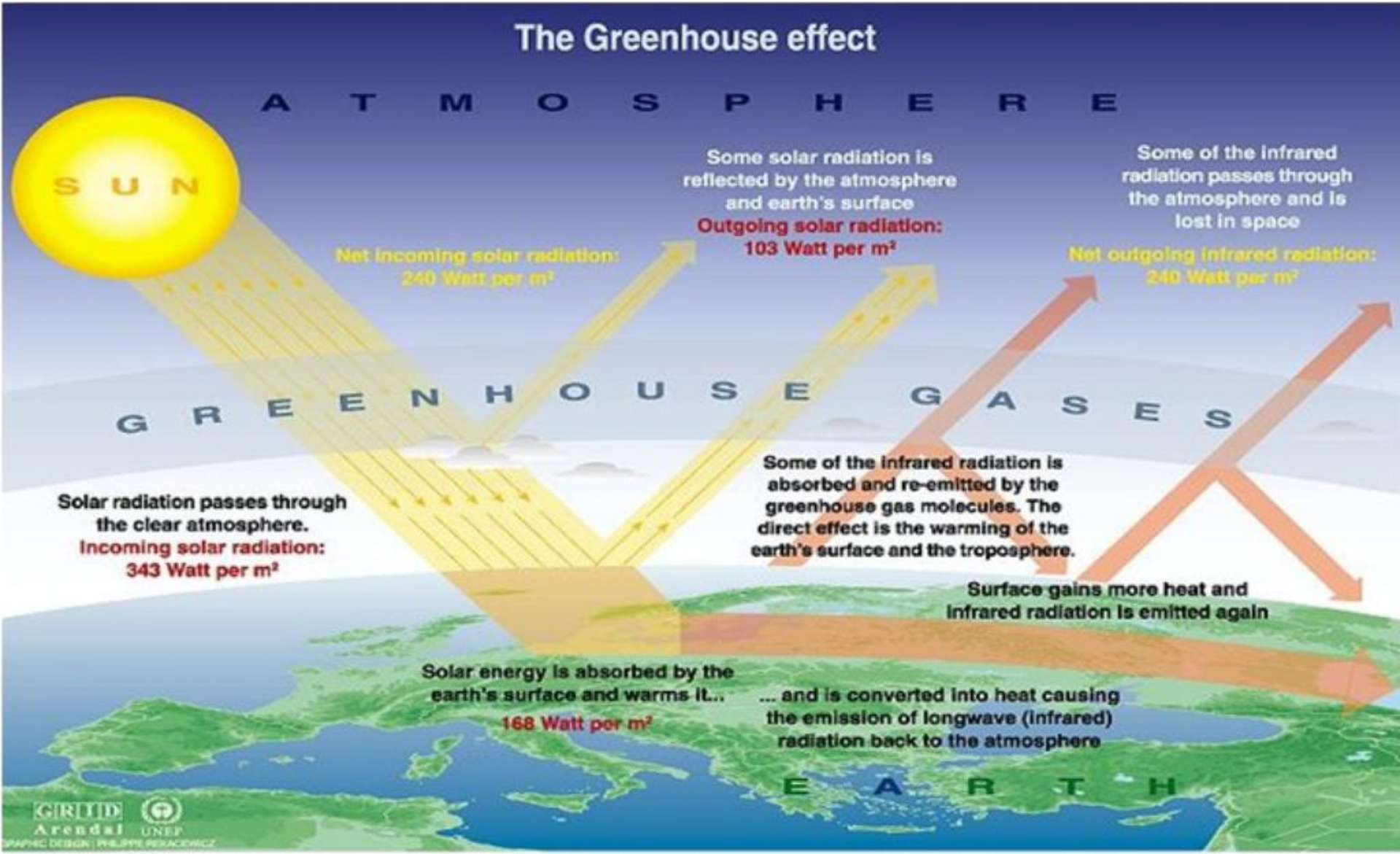
Global Warming due to increased concentration of GHG

Increasing sea level

Changes in wind and precipitation

Changes in Crop yields

Global warming



Sources: Okanagan university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996.

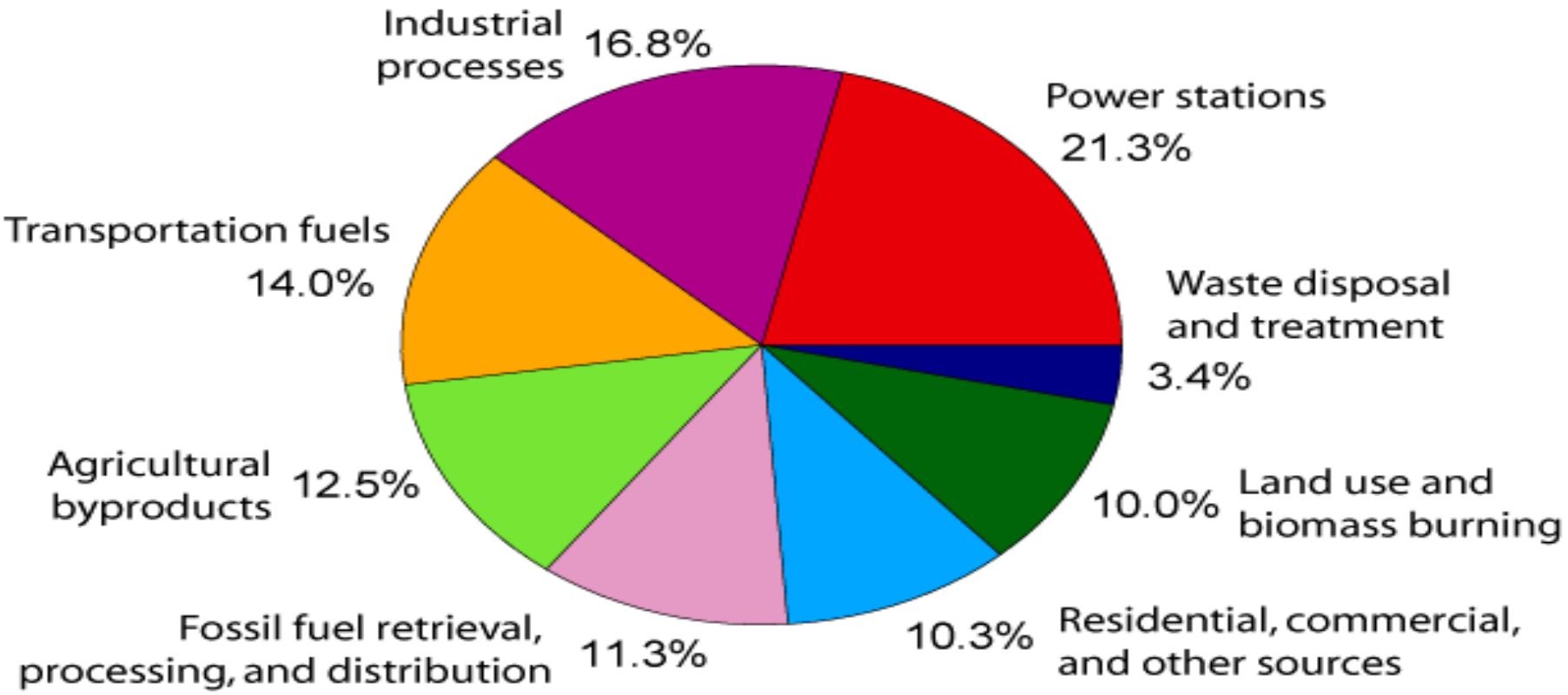
Green House Gases

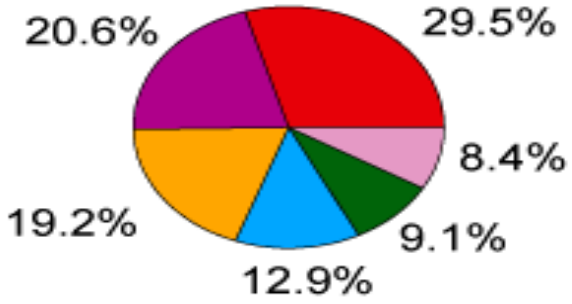
1. Carbon Dioxide
2. Methane
3. Nitrous Oxide
4. Hydro fluorocarbons
5. Per fluorocarbons
6. Sulfur Hexafluoride
7. Nitrogen Oxides
8. Carbon monoxide
9. Non Methane Volatile Organic Compounds (NMVOCs)

1 to 6 : Direct GHG

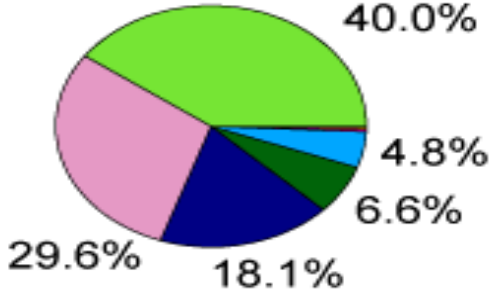
7 to 9: Indirect GHG

Annual Greenhouse Gas Emissions by Sector

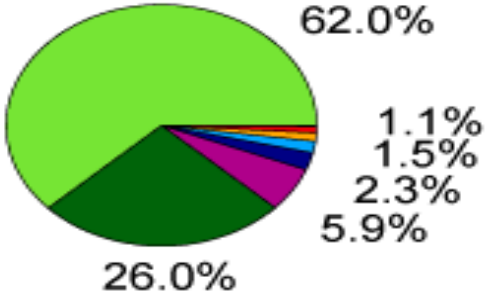




Carbon Dioxide
(72% of total)

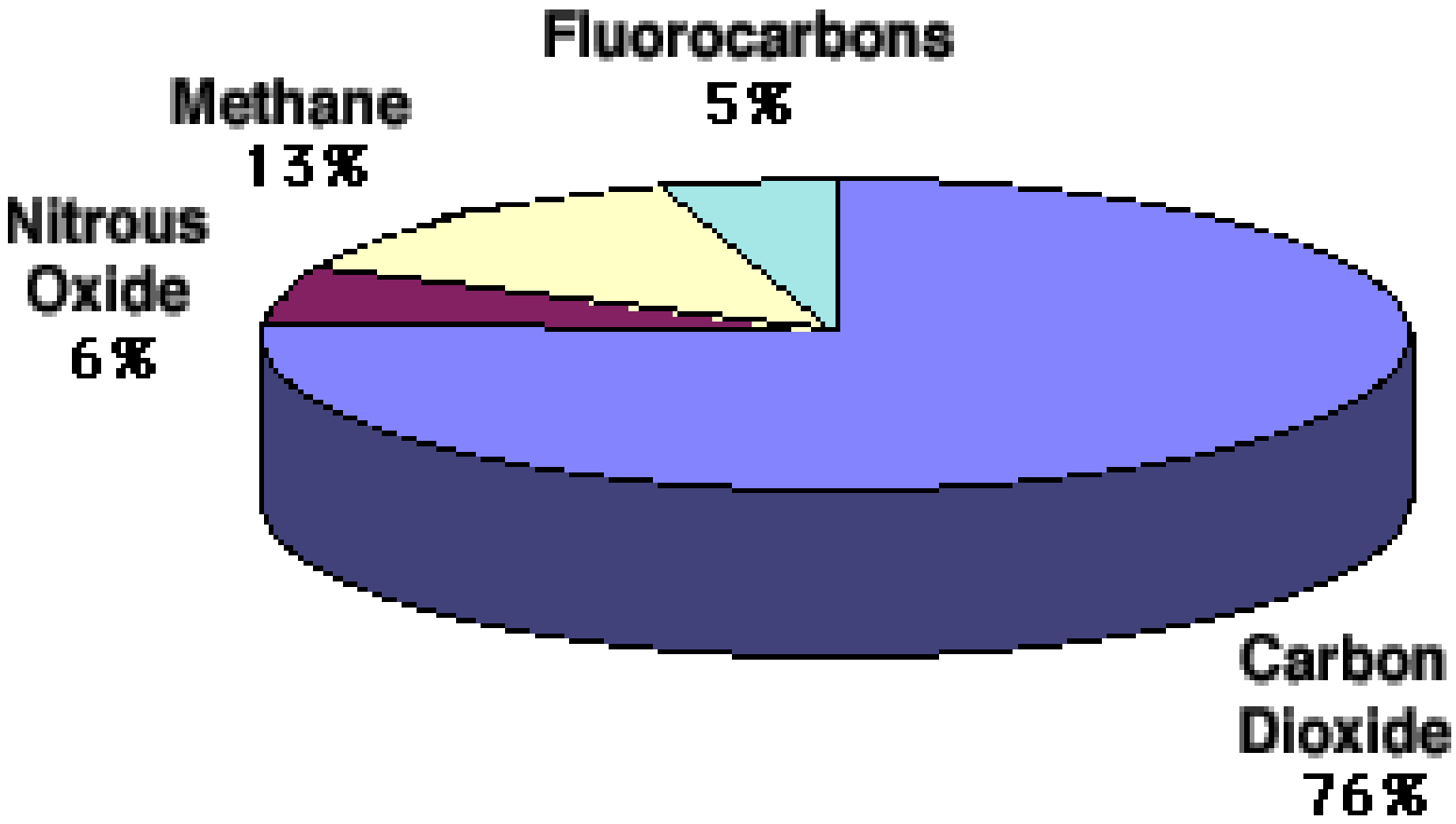


Methane
(18% of total)



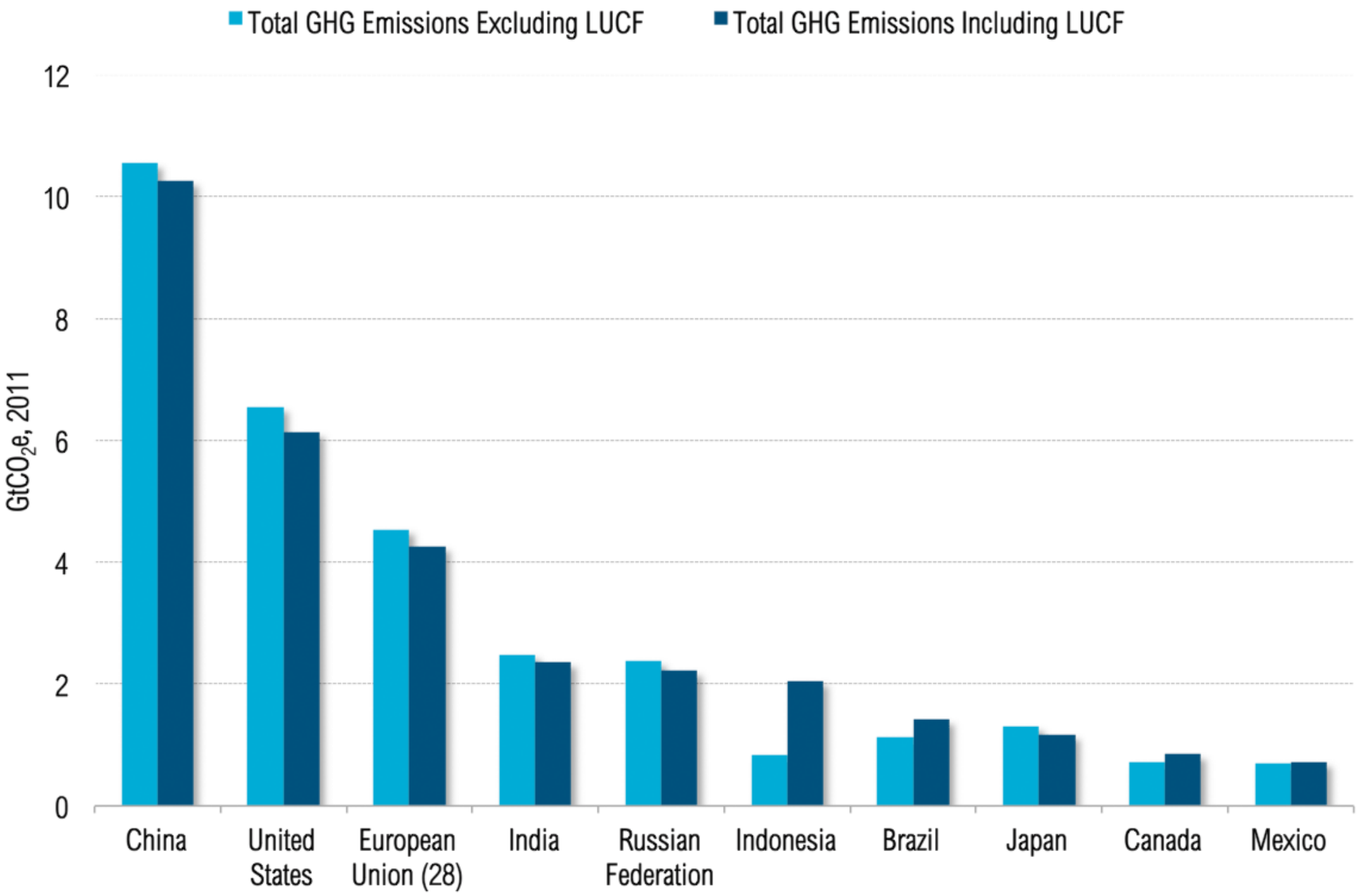
Nitrous Oxide
(9% of total)

Source: wikipedia.org



Source: www.umich.edu

Top 10 Emitters



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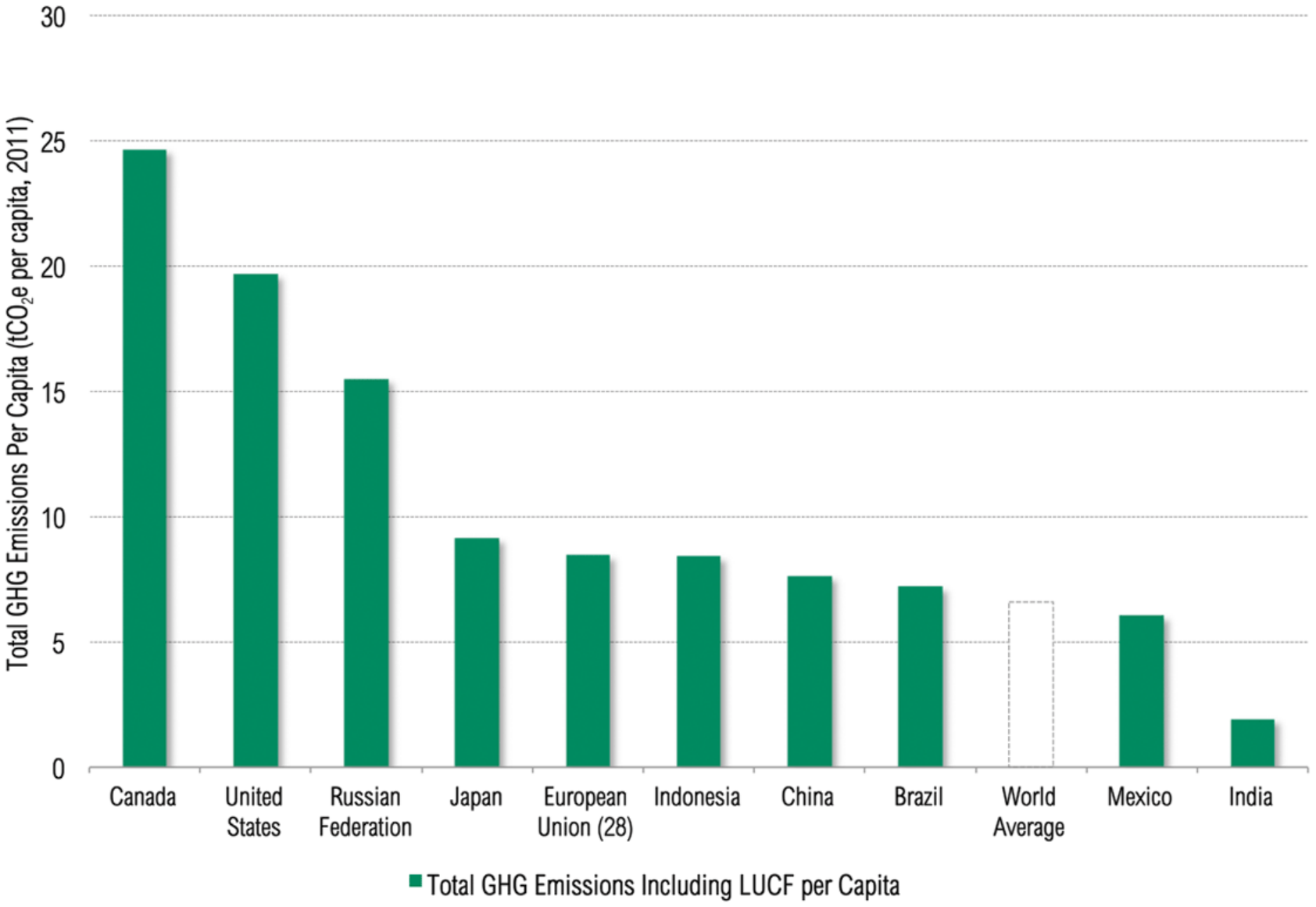
Per Capita Emissions for Top 10 Emitters



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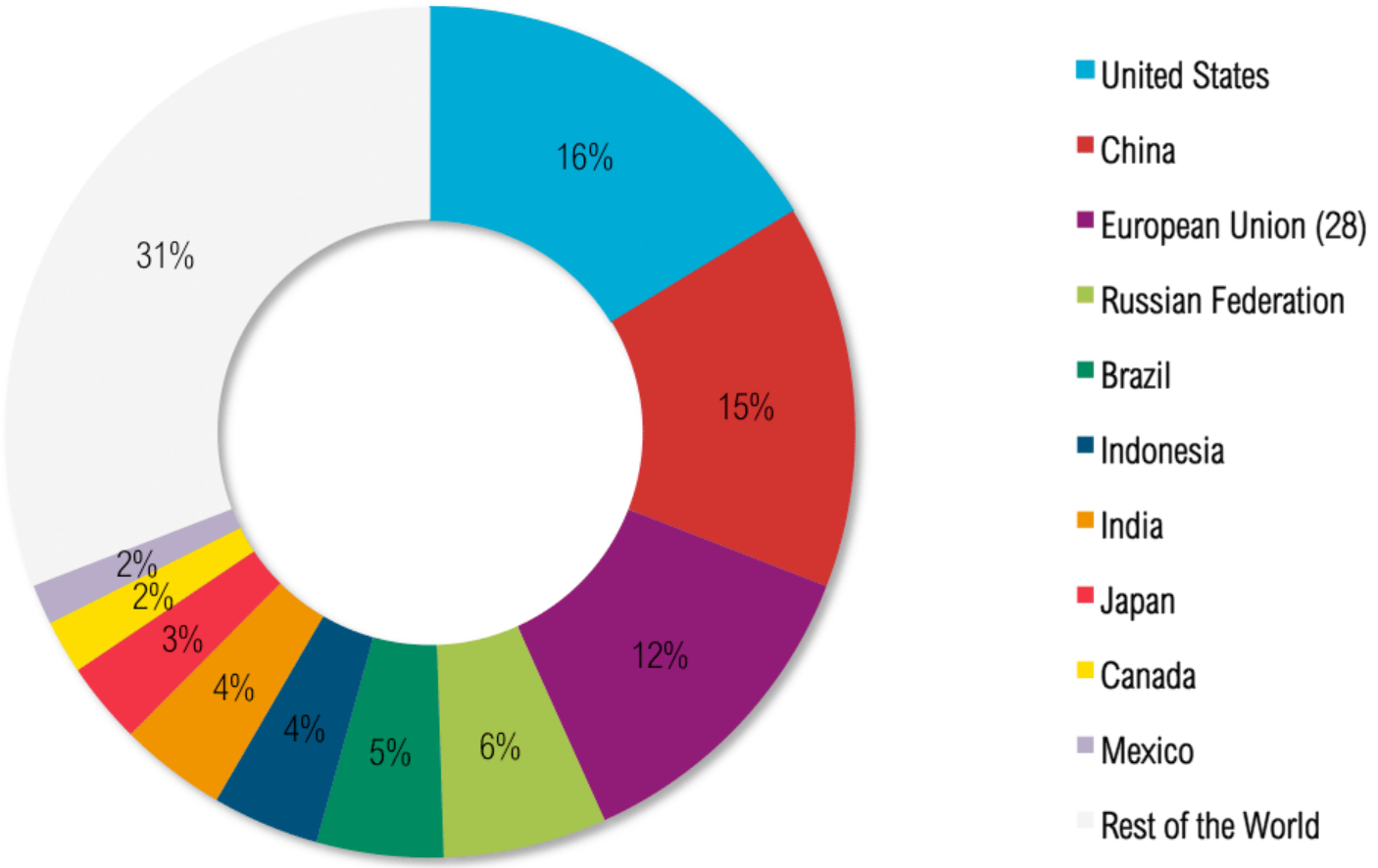
Cumulative GHG Emissions 1990–2011 (% of World Total)



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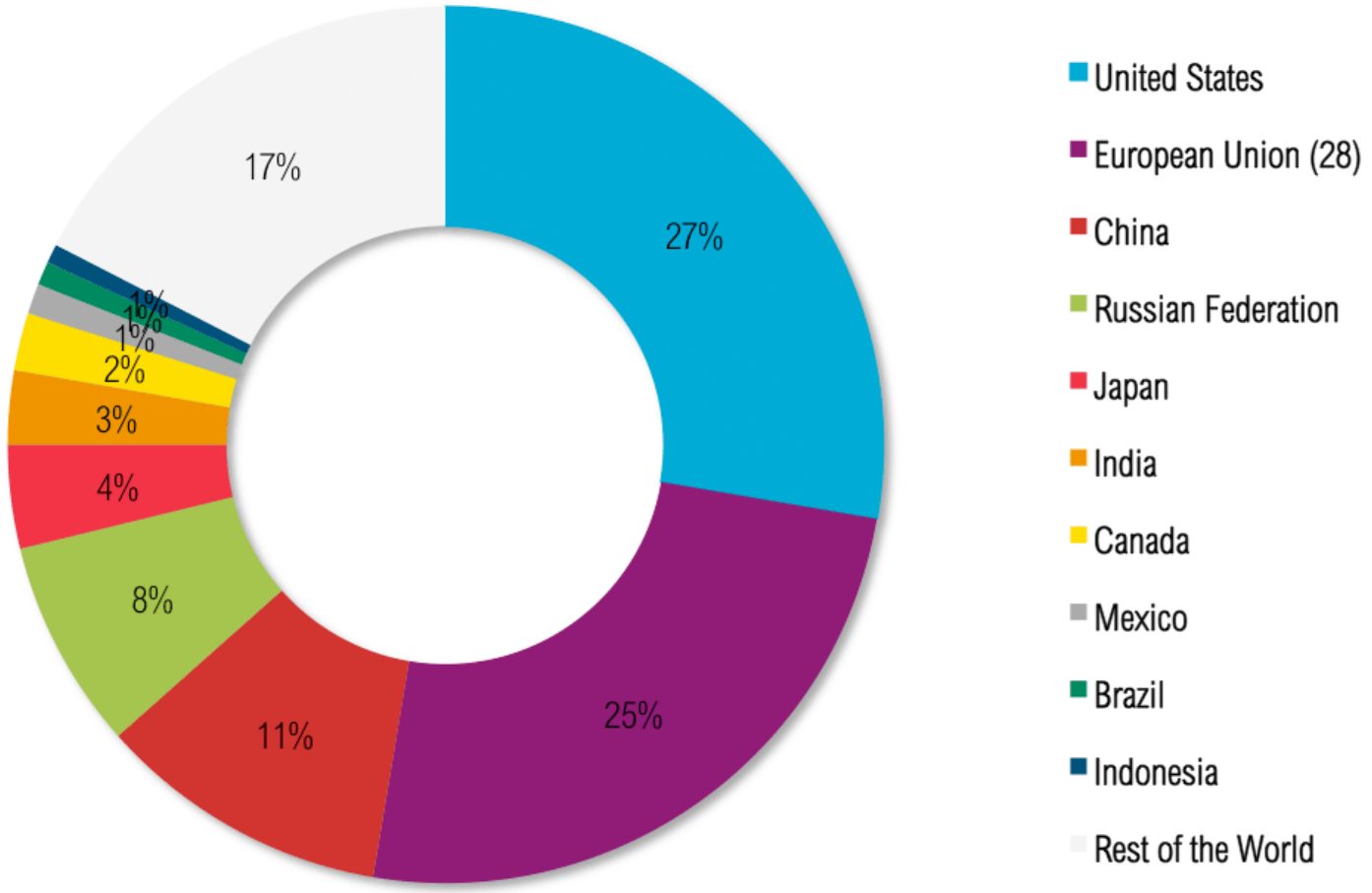
Cumulative CO_2 Emissions 1850–2011 (% of World Total)



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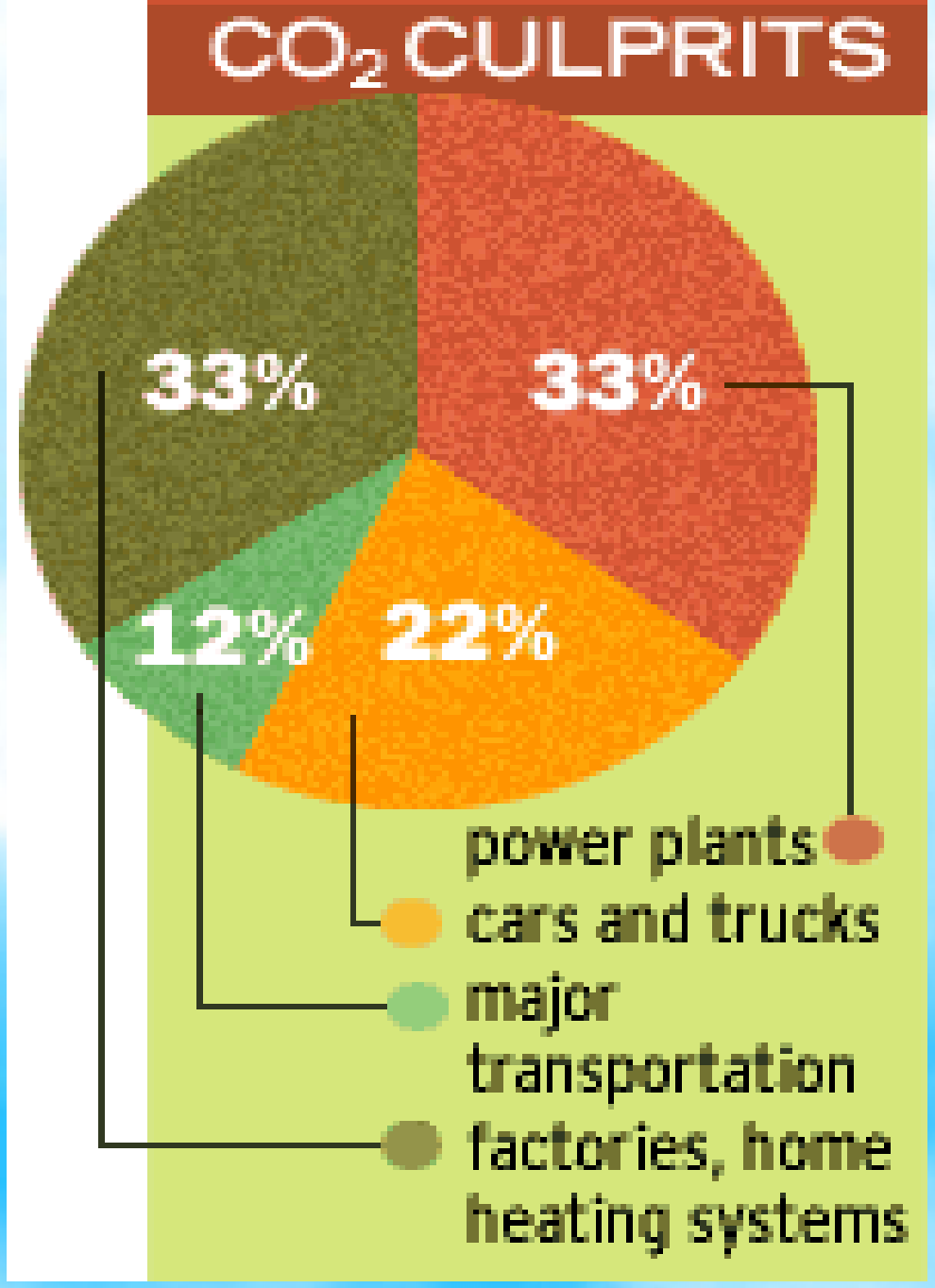


www.envirolink.org/orgs/edf/sitemap.html

- Rice cultivation has developed into a large business; farmland has doubled in the past 45 years. (www.envirolink.org/orgs/edf/sitemap.html) It feeds 1/3 of the World's population. It grows mostly in flooded fields, where bacteria in waterlogged soil releases methane.
- Livestock such as cows, sheep, goats, camels, buffaloes, and termites release methane as well. Bacteria in the gut of the animal break down food and convert some of it to methane. When these animals belch, methane is released. In one day, a cow can emit ½ pound of methane into the air. Imagine 1.3 billion cattle each burping methane several times per minute!

Effects of Global Warming

Climate Changes

Temperature

Precipitation

Sea Level Rise

Health Impacts

Weather-related Mortality
Infectious Diseases
Air Quality-Respiratory Illnesses

Agriculture Impacts

Crop Yields
Irrigation Demands

Forest Impacts

Forest composition
Geographic range of forests
Forest health and productivity

Water Resource Impacts

Water supply
Water quality
Competition for water

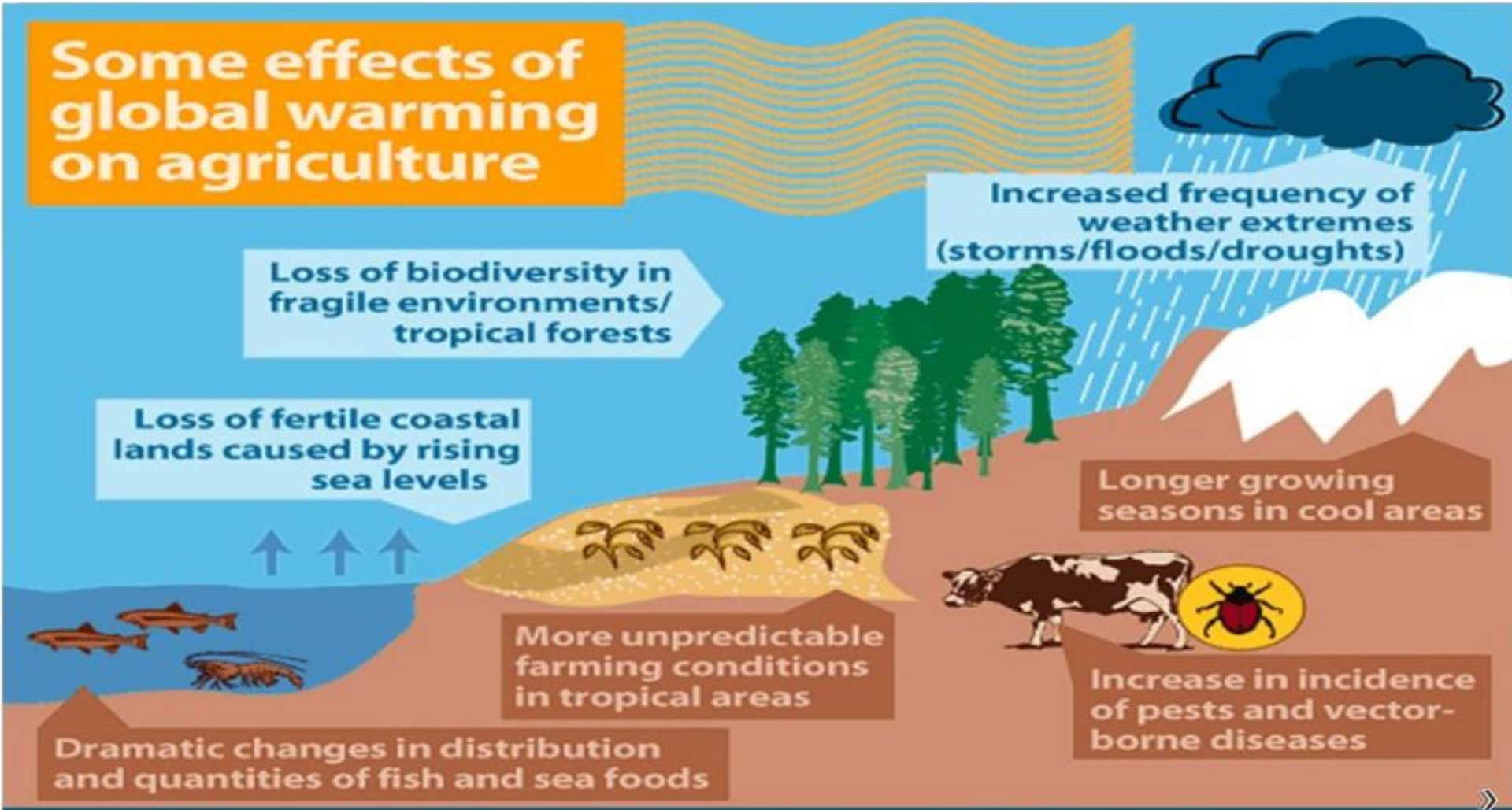
Impacts on Coastal Areas

Erosion of beaches
Inundation of coastal lands
Additional costs to protect coastal communities

Species and Natural Areas

Loss of habitat and species

Effects of Global Warming



Long-term fluctuations in weather patterns could have extreme impacts on agricultural production, slashing crop yields and forcing farmers to adopt new agricultural practices in response to altered conditions.

INTERNATIONAL NEGOTIATIONS - KEY STEPS

- **The Convention**
- **Kyoto Protocol**
- **Bali Road Map**
- **Cancun Agreements**
- **Durban Out Comes**
- **Doha Climate Gate Way**
- **Bonn Conference June – 2013**
- **COP 21-Paris-2015**

Conference Of Parties (COP-21) Paris-2015

Highlights:

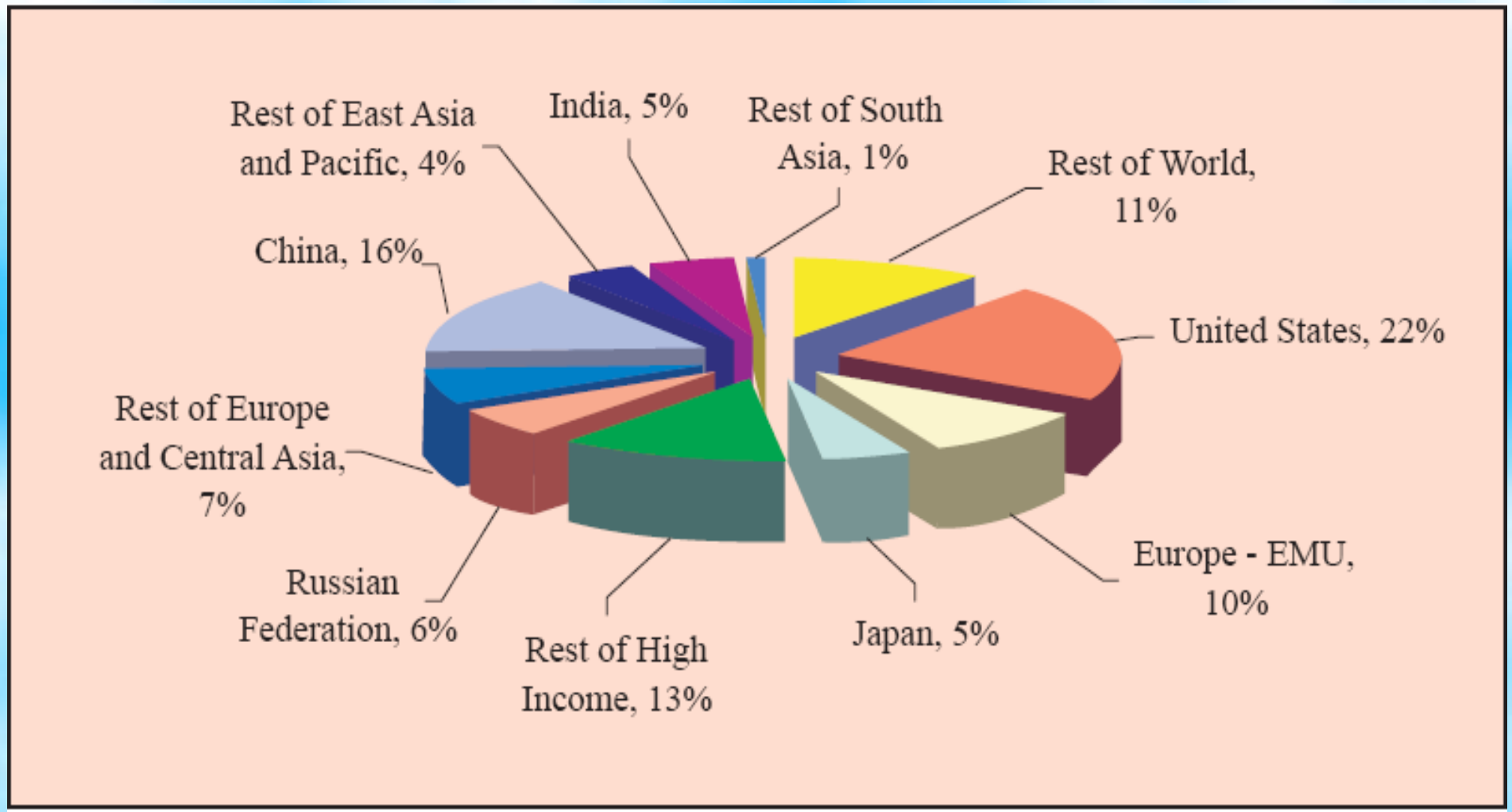
- 195 countries are part of the historic agreement reached at Paris conference
- Agreement to keep global temperature rise this century below 2^0 C

- Agreed to drive efforts to limit the temperature increase even further to 1.5^0 C above pre-industrial levels which is say for defence line against the worst impacts of a changing climate.
- Agreed to ain to strengthen ability to deal with impact on climate change
- Principle of future national plans will be no less ambitious than existing ones. Countries to submit updated climate plans every 5 years.

- Agreed for appropriate financial flows to be put in place to the tune of approximately US $100 billion by 2020, a legal binding for developed nations. There was an agreement to decarbonise their energy mix which means moving away from burning fossil fuel to clean energy sources. Example: renewable and nuclear
- Agreed to strengthen support to developing nations by developed nations on both technical and financial matters, a legal obligation for the developed countries

- The agreement comes into force after 55 nations that account at least 55% of global emissions, have deposited their instrument of ratification

India's share in Global CO_2 Emissions



Source: World Development Indicators, 2007

Possible impact of climate change on India

- Additional stress on ecological and socio-economic systems particularly in view of the fact India has to support a huge growing population, a 7500-km long densely populated and low-lying coastline, economy heavily dependent upon natural resource base.

Possible impact of climate change on India

- The various studies conducted in the country have shown that the surface air temperatures in India are going up at the rate of 0.4^{o}C per hundred years, particularly during the post-monsoon and winter season. Using models, they predict that mean winter temperatures will increase by as much as 3.2^{o}C in the 2050s and 4.5^{o}C by 2080s, due to Greenhouse gases. Summer temperatures will increase by 2.2^{o}C in the 2050s and 3.2^{o}C in the 2080s.

Possible impact of climate change on India

- Extreme temperatures and heat spells have already become common over Northern India, often causing loss of human life. In 1998 alone, 650 deaths occurred in Orissa due to heat waves.

Possible impact of climate change on India

- Melting season for glacier of Hindukush and Himalayan ranges coincides with the summer monsoon season. Any intensification of the monsoon is likely to enhance to flood disasters in the Himalayan catchment. Rising temperatures will also contribute to the raising of snowline, reducing the capacity of this natural reservoir, and increasing the risk of flash floods during the wet season.

Possible impact of climate change on India

- Increased temperatures will impact agricultural production. Higher temperatures reduce the total duration of a crop cycle by inducing early flowering, thus shortening the ‘grain fill’ period. The shorter the crop cycle, the lower the yield per unit area.
- A trend of sea level rise of 1 cm per decade has been recorded along the Indian coast. Sea level rise due to thermal expansion of sea water in the Indian Ocean is expected to be about 25-040 cm by 2050. The could inundate low lying areas, down coastal marshes and wetlands, erode beaches, exacerbate flooding and increase the salinity of rivers, bays and aquifers.

Possible impact of climate change on India

- According to Scientists at IIT-Delhi, India will experience a decline in summer rainfall by the 2050s. Summer rainfall accounts for almost 70% of the total annual rainfall over India and is crucial to Indian agriculture. Relatively small climatic changes can cause large water resource problems, particularly in arid and semi-arid regions such as northwest India. This will have an impact on agriculture, drinking water and on generation of hydro-electric power.

Possible impact of climate change on India

- Deltas will be threatened by flooding, erosion and salt intrusion. Loss of coastal mangroves will have an impact on fisheries. The major delta area of the Ganga, Brahmaputra and Indus rivers, which have large populations reliant on riverine resources will be affected by changes in water regimes, salt water intrusions and land loss.

Possible impact of climate change on India

- Increase in temperatures will result in shifts of lower altitude tropical and subtropical forests to higher altitude temperate forest regions, resulting in the extinction of some temperate vegetation types. Decrease in rainfall and the resultant soil moisture stress could result in drier teak dominated forests replacing sal trees in central India. Increased dry spells could also place dry and moist deciduous forests at increased risk from forest fires.

Possible impact of climate change on India

- Medical Science suggests that the rise in temperature and change in humidity will adversely affect human health in India. Heat stress could result in heat cramps, heat exhaustion, heat stroke, and damage physiological functions, metabolic processes and immune systems. Increased temperatures can increase the range of vector borne diseases such as malaria, particularly in regions where minimum temperatures currently limit pathogen and vector development.

India's National Action Plan on Climate Change

- National Action Plan on Climate Change (NAPCC) outlines existing and future policies and programmes addressing climate mitigation and adaptation.
- The Plan was launched in the year 2008 and identifies eight core National Missions through 2017 and directs Ministries to submit detailed implementation plans to the Prime Minister's Council on climate change.

India's National Action Plan on Climate Change

- The eight core Missions are
  - National Solar Mission
  - National Mission for Enhanced Energy Efficiency
  - National Mission on Sustainable Habitate.
  - National Water Mission
  - National Mission for Sustaining the Himalayan Eco System
  - National Mission for a Green India
  - National Mission for Sustainable Agriculture
  - National Mission on Strategic Knowledge for Climate Change.

- Intended nationally determined contributions (INDCS) Plan submitted to UN govt. during COP-21 at Paris
- Indian government pledged reduction of carbon emissions relative to its GDP by 33% to 35% from 2005 levels by 2030
- India also pledged that 40% of the country's electricity would come from non fossil fuel based sources, such as wind and solar power by 2030
- India increased solar power capacity goal for 2030 from 20 GW to 175 GW

Difficulties in Reduction of Emission by India

- Six most emissions – intensive industrial sectors – steel, cement, aluminium, fertilizers, papers and power, which account for over 60% of India's CO_2 emissions – shows many of them are actually operating at global best levels.
- India's cement industry is one of the most efficient globally due to its use of modern technologies and lending materials (fly ash and slag).
- Urea plants, specially gas based ones are today defining best practices.
- 80% of Aluminium industry is already using best smelting technology, remaining are converting as they cannot compete due to high energy cost.
- India's coal based thermal power plants are more efficient than the global average. NTPC operates at 33% efficiency, one of the highest in the world given the sub-critical technology and poor quality coal the company uses. Efficiencies could rise by super-critical and ultra-supercritical plants, but India's poor coal quality and high temperature and humidity will affect achievement.

- Sectors that are lagging behind are steel and paper. By 2030, 60% of steel will be made from sponge-iron, which is energy inefficient and polluting.
- Paper sector is suffering with problems of small size, multiplicity of raw material, technological obsolescence and multi-product nature of plants. More paper in India will be produced from waste paper and market pulp. Instead of sequestering carbon through the social and farm forestry.
- At 8% GDP growth rate for the next 20 years means production in all sectors, other than fertilizer (Urea), will grow 4 – 5 fold.
- By 2020, other than power, more sectors in India will operate at best technique levels or what can be practically achieved.
- In power sector, everything will depend upon how ambitious we are in deploying low carbon/renewable technologies. Cost would be the major factor.

- India’s voluntary commitment to reduce emissions intensity of its GDP by 20-25% by 2020 in comparison to 2005 level can be met at a high cost, but not enough to be left undoable. The tough part will begin after 2020, when the emissions intensity of the sectors starts to stagnate. The options are either to change the energy source from coal to renewable or develop new revolutionary technologies.
- By 2030, even if India installs 100,000 MW of solar energy, coal will still have to provide close to 60% of the total power generation. India also faces the challenge to provide affordable power to a huge number of people, who are still not connected to the grid. The bottom line, therefore, is that reducing emissions in an 8% growth trajectory, post 2020 is going to be a tough task.

Source: Centre for Science & Environment, New Delhi

United Nations Framework Convention on Climate Change

- Act signed by 195 nations in 1992 at Rio de Janeiro.
- Annex 1 & Non-Annex 1 countries.
- Annex 1 (developed countries) agreed to reduce their GHGs by 5.2% below 1990 levels in 1st commitment period 2008 – 2012.

CARBON CREDIT

1 CARBON CREDIT ≈ Reduction of 1 ton of CO_2 or its equivalent greenhouse gas (GHG) and is an entitled for one certified reduction certificate by UNFCCC.

How buying carbon credits can reduce emissions

- Carbon credits create a market for reducing greenhouse emissions by giving a monetary value to the cost of polluting the air. Emissions become an internal cost of doing business and are visible on the balance sheet alongside raw materials and other liabilities or assets.
- By way of example, consider a business that owns a factory putting out 100,000 tonnes of greenhouse gas emissions in a year.
- So the factory is given a quota of say 80,000 tonnes per year. The factory either reduces its emissions to 80,000 tonnes or is required to purchase carbon credits to offset the excess.
- One seller might be a company that will offer to offset emissions through a project in the developing world, such as recovering methane from a swine farm to feed a power station that previously would use fossil fuel. So although the factory continues to emit gases, it would pay another group to reduce the equivalent of 20,000 tonnes of carbon dioxide emissions from the atmosphere for that year.

- Another seller may have already invested in new low-emission machinery and have a surplus of allowances as a result. The factory could make up for its emissions by buying 20,000 tonnes of allowances from them. The cost of the seller's new machinery would be subsidized by the sale of allowances. Both the buyer and the seller would submit accounts for their emissions to prove that their allowances were met correctly. It is the hole process of buying carbon credit.

India's Potential

- India – Non Annex I country, has a large scope in emissions trading.
- India and China together contribute to $5 billion of the global carbon trade estimated at $30billion.
- One of the leading generators of CERs through CDM.

Definitions

Carbon Sink – A carbon sink is a natural or man-made reservoir that accumulates and stores some carbon containing chemical compound for an indefinite period. Main natural sinks are oceans and photosynthesis by plants and algae. Main man-made sinks are land fills, carbon capture and storage mechanisms.

Carbon fixation – Refers to any process through which gases carbon dioxide is converted into a solid compound. It mostly refers to the processes found in autotrophies (organisms that produce their own food), usually given by photosynthesis. Carbon fixation can also be carried out by the process of calcification in marine, calcifying organisms and also by heterotrophic organisms.

Carbon sequestration – is a geo-engineering technique for long term storage of carbon dioxide and other forms of carbon, for the mitigation of global warming. Carbon dioxide is usually captured from the atmosphere through biological, chemical or physical processes. Sequestration techniques are time consuming. Globally soils are estimated to contain approximately 1,500 Giga Ton of organic carbon, more than the total of carbon in vegetation and atmosphere. Modification of agricultural practices is a recognised method of carbon sequestration as soil can act as an effective carbon sink or setting as much as 20% of carbon dioxide emissions annually.

Carbon Footprints - A **carbon footprint** is "the total set of greenhouse gases (GHG) emissions caused by an organization, event or product". For simplicity of reporting, it is often expressed in terms of the amount of carbon dioxide, or its equivalent of other GHGs, emitted.

•The concept name of the carbon footprint originates from ecological footprint discussion. The carbon footprint is a subset of the ecological footprint and of the more comprehensive Life Cycle Assessment (LCA).

•An individual, nation, or organization's carbon footprint can be measured by undertaking a GHG emissions assessment. Once the size of a carbon footprint is known, a strategy can be devised to reduce it, e.g. by technological developments, better process and product management, changed Green Public or Private Procurement (GPP), Carbon capture, consumption strategies, and others.

•The mitigation of carbon footprints through the development of alternative projects, such as solar or wind energy or reforestation, represents one way of reducing a carbon footprint and is often known as Carbon offsetting.

carbon offset – is a financial instrument aimed at a reduction in greenhouse gas emissions. Carbon offsets are measured in metric tons of carbon dioxide-equivalent (CO2e) and may represent six primary categories of greenhouse gases. One carbon offset represents the reduction of one metric ton of carbon dioxide or its equivalent in other greenhouse gases.

Carbon Intensity – The amount of carbon by weight emitted per unit of energy consumed.

Carbon Credit - A **Carbon credit** is a generic term meaning that a value has been assigned to a reduction or offset of greenhouse gas emissions. Carbon credits and markets are key components of national and international attempts to mitigate the growth in concentrations of greenhouse gases (GHGs). One carbon credit is equal to one ton of carbon dioxide, or in some markets, carbon dioxide equivalent gases. Carbon trading is an application of an emissions trading approach. Greenhouse gas emissions are capped and then markets are used to allocate the emissions among the group of regulated sources. The goal is to allow market mechanisms to drive industrial and commercial processes in the direction of low emissions or less carbon intensive approaches than those used when there is no cost to emitting carbon dioxide and other GHGs into the atmosphere. Since GHG mitigation projects generate credits, this approach can be used to finance carbon reduction schemes between trading partners and around the world.

THANK YOU

AND

FOLLOW THE SLOGAN

REDUCE, REUSE & RECYCLE