ENVIS NEWSLETTER

CENTRE FOR ENVIRONMENTAL STUDIES
N-3/56, IRC VILLAGE, BHUBANESWAR-751015
(Forest & Environment Department, Government of Orissa)

Feb-Apr. 07 Vol-8 No-1

Dr. H.K. Panda, Principal Secretary, Forest & Environment Department, Govt. of Orissa (Centre) releasing the ENVIS newsletter on 5th June 2007 on World Environment Day.

Also present are (R-L), Sri B.K. Patnaik, Director, Environment-cum-Spl. Secy. to Govt. and Sri P. R. Mohanty, Principal Chief Conservator of Forests, Orissa

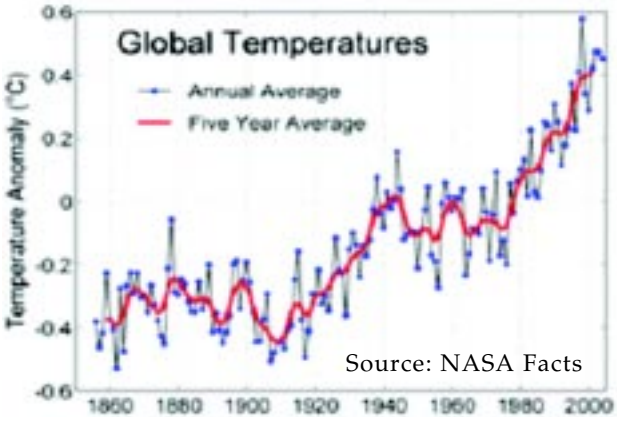
State of Environment: Climate Change

Climate is the description of the long-term pattern of weather in a particular area. Changing climate will affect people around the world. Rising global temperature is expected to raise sea levels and change precipitation and other local climate conditions. Since pre-industrial times, increasing emissions of Green House Gases (GHGs) due to human activities have led to marked increase in atmospheric GHG concentrations. In Orissa, an estimated 40 million tons of carbon dioxide is emitted to the atmosphere annually. Recent climate changes and climate variations are beginning to have effects on many natural and human systems. Earlier Western Orissa was a known calamity hotspot but now the coastal areas are also experiencing heat waves. Although climate change does not take place over night, but in the recent decades Orissa's climate has been changing for the worse, which is a matter of concern.

The difference between weather and climate is a measure of time. Weather is the conditions of the atmosphere over a short period of time and climate is how the atmosphere behaves over relatively long periods of time. Climate is the description of the long-term pattern of weather in a particular area. Some scientists define climate as the average weather for a particular region and time period, usually taken over 30 years. Climate is related to averages of precipitation, temperature, humidity, sunshine, wind velocity, phenomena such as fog, frost and hail storms and other measures of the weather that occur over a long period in a particular place.

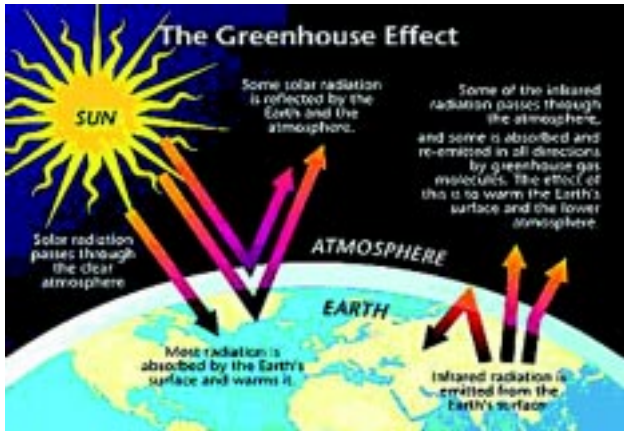
Changing climate will affect people around the world. Rising global temperature are expected to raise sea levels and change precipitation and other local climate conditions. Changing regional climate could alter forests, crop yields and water suppliers. It could also affect human health, animals and many types of ecosystem.

Global warming is the observed increase in the average temperature of the Earth's near-surface air and oceans in recent decades and its projected continuation. The National Academy of Sciences, a leading scientific body in the U.S., determined that the Earth's surface temperature has risen by about 1 degree Fahrenheit in the past century, with accelerated warming during the past two decades.



Human activities have altered the chemical composition of the atmosphere through the build up of Green House Gases (GHGs) - primarily carbon dioxide, methane and nitrous oxide. The heat-trapping property of these gases is undisputed although uncertainties exist about exactly how Earth's climate responds to them.

Based on estimates by NASA's Goddard Institute for Space Studies, 2005 was the warmest year since reliable, widespread instrumental measurement became available in the late 1980s, exceeding the previous record set in 1998 by a few hundredths of a degree. Estimates prepared by the World Meteorological Organization and the UK Climate Research Unit concluded that 2005 was the second warmest year, behind 1998.



Life exists because Green House Gases help in maintaining the Earth's temperature at a desired level. It acts like a blanket. They prevent much of the absorbed solar heat from escaping into the atmosphere. This natural phenomenon keeps the earth warm enough to sustain life. Problems arise when the concentration of GHGs in the atmosphere starts increasing due to human activities. Burning fossil fuels like coal and oil to derive energy, deforestation and biomass burning are some such activities.

As we are heavily dependent on carbon-based fossil fuels, the Earth's temperature has increased consistently due to global warming. The maximum impact of global warming will be borne by developing countries like India, which have hardly contributed to the problem.

Greenhouse gas emission trends -

Global green house gas emissions have grown since pre-industrial times, with an increase of 70% between 1070 and 2004. Since pre-industrial times, increasing emissions of GHGs due to human activities have led to marked increase in atmospheric GHG concentrations. Between 1970 and 2004, global emissions of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 have increased by 70 % from 28.7 to 49 Gigatonnes of Carbon dioxide equivalents ($GtCO_2$-eq). CO_2 emissions have grown by about 80%. The largest growth in global GHG emissions between 1970 and 2004 has come from the energy supply sectors. It is estimated that at present CO_2 emission into the atmosphere worldwide is 57000 million tones per annum due to man-made causes. CO_2 is continuously increasing in the atmosphere. It increased to 350 ppm in 2000 from 312 ppm in 1940. The level of CO_2 in the atmosphere is maintained in a steady state through the process of photosynthesis carried out by green plants, which reduces CO_2 and increases oxygen in the atmosphere. Therefore, to absorb the huge quantities of CO_2 generated sufficient green plant cover by way developing forestry should be in place. If no green house effect existed, the average temperature of earth would have been ~19°C making life incompatible. However, too much of green house effect also leads to temperature rise which affects agricultural production, reduce the rainfall, increase evaporation and sea level rise because of melting of ice caps at the polar region. In Orissa, annually an estimated 40 million tons of carbon dioxide is emitted to the atmosphere at the present generation level of the coal based thermal power plants (State of Environment Report).

As per the Intergovernmental Panel on Climate Change (IPCC) report many natural systems in the world are being affected by regional climate changes particularly temperature increases. These are in the form of enlargement and increased numbers of glacial lakes; increasing ground instability in permafrost regions; rock avalanches in mountain regions and changes in some Arctic and Antarctic ecosystems including those in sea-ice biomes and also predators high in the food chain. There are some evidences of increased run-off and earlier spring peak discharge in many glacier-and snow-fed rivers and warming of lakes and rivers in many regions with effects on thermal structure and water quality. Based on more evidence from a wide range of species, the recent warming is strongly affecting terrestrial biological systems including changes as earlier timing of spring events such as leaf-unfolding, bird migration and egg laying. Based on satellite observations since early 1980s, 'greening' of vegetation in the soaring linked to longer thermal growing seasons due to recent warming. The changes in marine and fresh water biological systems, associated with rising water temperatures as well as related changes in ice cover, salinity, oxygen levels and circulation, include shifts in ranges and changes in algal, plankton and fish abundance in high-latitude oceans; increases in algal and zooplankton abundance in high-latitude and high-altitude lakes; and range changes and earlier migrations of fish in rivers.

The uptake of anthropogenic carbon since 1750 has led to the ocean becoming more acidic with an average decrease in pH of 0.1. Changes in many physical and biological systems are linked to anthropogenic warming.

Recent climate changes and climate variations are beginning to have effects on many natural and human systems. Settlements in mountain regions are at enhanced risk to glaciers. In the Sahelian region of Africa, warmer and drier conditions have led to a reduced length of growing season with detrimental effects on crops. In Southern Africa, longer dry seasons and more uncertain rainfall are prompting adaptation measures. Sea-level rise and human development are contributing to losses of coastal wetlands and mangroves and increasing damage from coastal flooding in many areas.

Orissa, on the eastern sea coast of India, enjoys a tropical monsoon type of climate like most other parts of the country. Its annual average rainfall is about 1500 mm. The South-West monsoon normally sets in between 5 th June in the coastal plain, and by 1 st July the whole of the State is under the full sway of the South-West monsoon and it exists up to 15 th October. Agriculture in Orissa is mostly dependent on monsoon. The state is characterized by high temperature, high humidity, medium to high rainfall and mild winters. Even though the quantum of rainfall is quite high, its distribution during the monsoon period is highly uneven and erratic. Floods, cyclones and droughts occur almost every year with varying intensity. Rainfall was less erratic before the 1950s. Most years prior to 1950s received normal or above normal rainfall. Rainfall has become much more erratic since the 1960s; most years recorded below-normal rainfall. Similarly, rainfall showed a rising trend from the beginning of the century to the end of the 1950s. It then declined from the 1960s onwards. During 1994 and 1995 rainfall was above normal and then it declined year 2002 onwards and risen in the year 2006.

In the past, the state's western region routinely experienced high temperatures and frequent droughts. Besides, many places in coastal Orissa are also burning hot in the recent decades. The mean daily maximum temperature of the state is gradually increasing as also the mean daily minimum temperature. Titlagarh and Koraput belt comprising entire south and western Orissa have witnessed an exceptional rise in daily maximum and minimum temperature. Earlier western Orissa was a known calamity hotspot but now the coastal areas are also experiencing heat waves. The average temperatures of the coastal region have risen and the temperature is fluctuating. Bhubaneswar now has a mean maximum temperature above 40^0 C which is comparable to Sambalpur located in the interior.

Current global warming trends show that conditions like El Nino will be more frequent thus cause for concern. Orissa's extreme weather, related closely to temperature rises, is an indicator of that. For more than a decade now, Orissa has experienced contrasting extreme weather conditions from heat waves to cyclones, from droughts to floods. They have not only become more frequent but have hit areas that were never considered vulnerable.

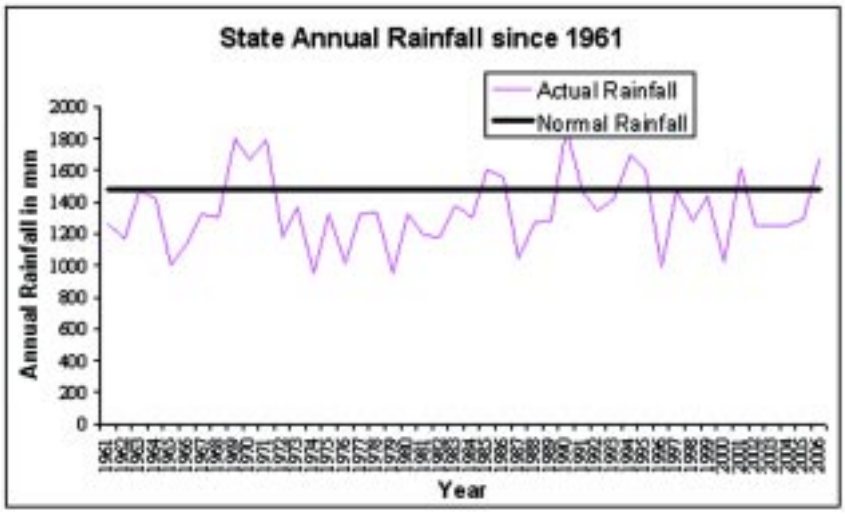
The state of Orissa has been declared disaster affected for 95 years out of the last 105 years. Floods have occurred for 50 years, droughts for 32 and cyclones have struck the state for 11 years. Orissa has experienced around 952 small and big cyclones and 451 tornadoes between 1891 and 1970. From 1901 to 1981 there were 380 cyclones of which 272 resulted from depressions in the Bay of Bengal. Twenty-nine of these cyclones were devastating. The frequency of cyclones has increased on the Orissa coast. In 1999, two cyclones hit the state in quick succession. The second one lasted three days and ravaged 14 coastal districts. Around 15 million people were affected. Two million tons of rice crop was lost and 17000 square kilometer of agricultural land was devastated. In the districts of Jagatsinghpur and Kendra Para, the forest cover has now been reduced by around 50 percent. The micro climate of the region has changed after this loss in vegetation. Due to calamities, an average 9,00,000 ha. of agricultural lands lose crop every year in the state. In the last 50 years the food production has decreased by 40 percent. Orissa is placed at the head of the Bay of Bengal where weather is formed. So even a slight change in the sea's behavior can have an immediate impact on the coast. The day becomes the centre of low pressure, bringing heavy rain and cyclones to the sub-continent, especially in Orissa. These cyclones and depressions involve circulations of over thousands of kilometers and form link between Orissa's atmosphere and the entire planetary circulation system. With mangrove forests being cleared more and more areas have come under the effect of cyclones.

Frequency of natural calamities in Orissa

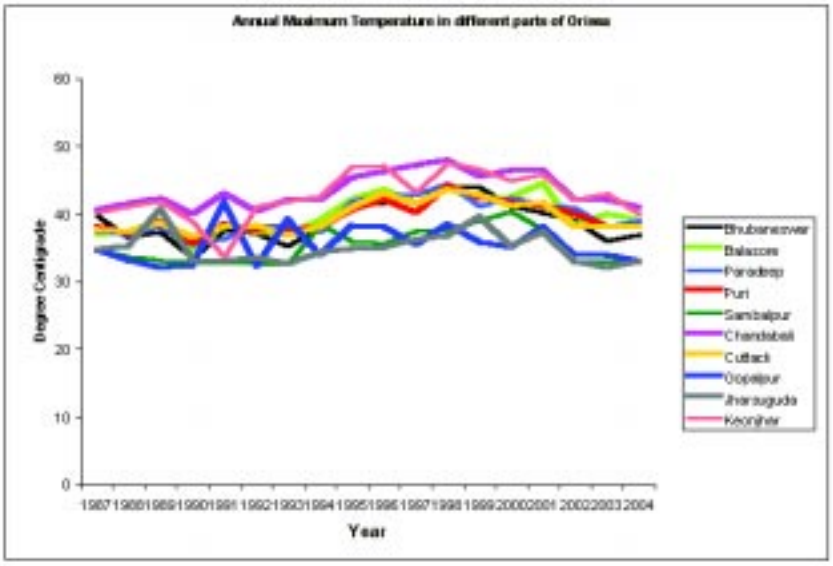
Year	Rainfall in mm	Remarks
1961	1262.8	---
1962	1169.9	---
1963	1467.0	---
1964	1414.1	---
1965	997.1	Severe drought
1966	1134.9	Drought
1967	1326.7	Cyclone & Flood
1968	1296.1	Cyclone & Flood
1969	1802.1	Flood
1970	1160.2	Flood
1971	1791.5	Flood, severe cyclone
1972	1177.1	Drought, Flood
1973	1360.1	Flood
1974	951.2	Flood, severe drought
1975	1325.6	Flodd
1976	1012.5	Severe drought
1977	1326.9	Flood
1978	1261.3	Tornados, hail storm
1979	950.7	Severe drought
1980	1321.7	Flood, drought
1981	1187.4	Flood, drought, tornados
1982	1179.9	Severe flood, drought, cyclone
1983	1374.1	---
1984	1302.8	Drought
1985	1606.8	Flood
1986	1566.1	---
1987	1040.8	Severe drought
1988	1270.8	---
1989	1283.9	---
1990	1865.8	Flood
1991	1465.7	---
1992	1344.1	Flood, drought
1993	1421.6	---
1994	1700.2	---
1995	1588.0	---
1996	990.1	Severe drought
1997	1493.0	---
1998	1277.5	Severe drought
1999	1435.7	Severe drought
2000	1035.1	Drought & Fllod
2001	1616.2	Flood
2002	1007.8	Severe drought
2003	1663.5	Flood
2004	1256.7	Moisture stress
2005	1497.7	—

Source: Directorate of Agriculture & Food Production

In 1998, a killer heat wave linked to the El Nino effect claimed over 2000 lives. While 2042 people were killed in 1998, 91 died in 1999, 29 in 2000, 25 in 2001, 41 in 2002, 67 in 2003 and 43 in 2004.

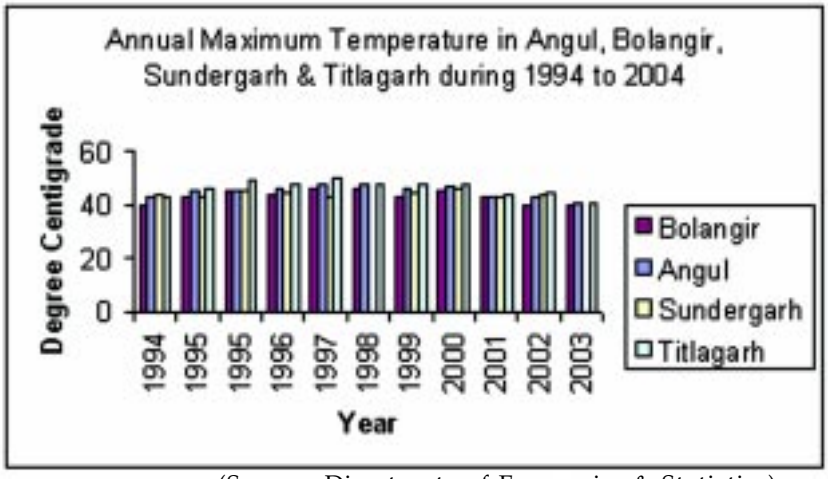


Rivers flood more areas due to siltation. Massive deforestation in the upstream area is not only destroying the livelihoods of the local people but also silting up river beds, causing floods in the downstream coastal Orissa.



Analysis of rainfall data and temperature variations confirms more prolonged summers in Orissa indicating that the state's climate is changing for the worse.

Climate change does not take place over night. It takes a long time for the climate to change. But in the recent decades Orissa's climate has been changing for the worse owing to a combination of factors such as deforestation, extensive construction activities, uncontrolled mining, elimination of water bodies and extensive carbon consumption.



(Source- Directorate of Economics & Statistics)

Projected Impacts due to Climate Change -

Recently concluded IPCC has projected some imapcts due to climate change in different parts of the world.

Africa: By 2020, between 75 and 250 million people are projected to exposed to an increase of water stress.

Agricultural production, including access to food, in many African countries and regions is projected to be severely compromised by climate variability and change. In some countries, yields from rain-fed agriculture could be reduced by up to 50% by 2020.

Towards the end of 21 st century, projected sea-level rise will affect low-laying coastal areas with large population. Mangroves and coral reefs are projected to be further degraded.

Polar Region: In the Polar Regions, the main projected biophysical effects are reductions in thickness and extent of glaciers and ice sheets, and changes in natural ecosystems with detrimental effects on many organisms including migratory birds, mammals and higher predators.

Small islands: Climate change is projected by the mid-century to reduce water resources in many small islands. Small islands, whether located in the tropics or higher lattitudes, have characteristics which make them especially vulnerable to the effects of climate change, sea level rise and extreme events.

Australia: Water security problems are projected to intensify by 2030 in Southern and eastern Australia, in New Zealand, in Northland and some eastern regions. Significant loss of biodiversity is projected to occur by 2020 in some ecologically rich sites.

Europe: Nearly all European regions are anticipated to be negatively affected by some future impacts of climate change. The impacts include increased risk of inland flash floods, and more frequent coastal flloding and increased erosion due to storminess and sea-level rise. Other projected negative impacts are high temperatures, drought, reduction of water availability & crop productivity in South; decrease in summer precipitation, water stress, health risks due to heat aves and decline in forest productivity in Central & East; and mixed effects in Northern Europe.

American countries: By mid-century, increases in temperature and associated decreases in soil water are projected to lead to gradual replacement of tropical forest by savanna in eastern Amazonia. Semi-arid vegetation will tend to replaced by arid-land vegetation. Tehre is also a risk of significant biodiversity loss through species extinctions. It is also projected to lead in salinisation and desertification of agricultural land especially in drier areas. Sea-level rise is projected to cause increased risk of flooding in low-lying areas. Other negative impacts are increase in sea surface temperature, adverse effects on coral reefs, change in precipitation patterns and disappearance of glaciers.

Asia: Glacier melt in the Himalayas is projected to increase flooding, and rock avalanches from destabilised slopes and to affect water resources within next two to theree decades. Fresh water availability in Central, South, East and South-East Asia, particularly in large river basins, is projected to decrease along with population growth and increasing demand arising from higher standards of living, could adversely affect more than a billion people by the 2050s. coastal areas, especially heavily-populated mega-delta regions, East and Southeast Asia, will be at greatest risk due to increased flooding from the sea and, in some mega-deltas, flooding from the rivers. Climate change will impinge on sustainable development of most developing countries of Asia,

The full process of manufacturing new stocks of Aluminium is responsible for 1 % of the global human-induced greenhouse gas emissions that scientists with the Intergovernmental Panel on Climate Change (IPCC) identify as cause of unnaturally accelerated rates of global warming. Onsite (direct) emissions in the production of primary (new) metal area responsible for 0.4% and offsite (indirect) emissions in the production of the energy fed into the smelting process account for the other 0.6%.

Source: ENVICON-2007

as it compounds the pressures on natural resources and the environment associated with rapid urbanisation, industrialisation and economic development. The crop yields is projected to decrease up to 30% in Central and South Asia by the mid-21st century. The risk of hunger will be very high in general developing countries. Water related health hazards is projected to rise in East, South and Southeast Asia.

Causes of Climate Change:

Climate change is not a sudden process. It is also very difficult to identify the main causes of climate change in a particular region. However some anthropogenic activities which are affecting the climate to some extent may be outlined. Every time we turn on a light switch, use a computer, watch television or cook a meal, we are creating carbon dioxide which is not only a naturally occurring gas crucial to our survival, but also the main contributor to climate change. The electricity we use is generated by power stations, most of which burn 'fossil fuels'. We also burn fossil fuels in other ways - every time we drive a vehicle. Burning of fossil fuels such as coal, oil and natural gas generates carbon dioxide. Carbon dioxide and other green house gases occur naturally and form a blanket around the Earth, trapping heat. We have been pumping additional CO_2 into the atmosphere for 200 years, since the industrial revolution, thus intesifying the green house effect and increasing the Earth's temperature. CO_2 emissions in the atmosphere have increased by about 30% over the past century. It is being worsen by the addition of other natural green house gases such as

What we can do to slow down climate change

Although the problem is immense, we can all contribute as individuals and as a society to efforts that will reduce green house gas emissions and thereby the harmful effects of climate change.

- ✓ Share what we have learnt about climate change and tell others about it.
- ✓ Buy more efficient household appliances.
- ✓ Replace all incandescent bulbs by compact fluorescent bulbs that last four times longer and use just one-fourth of the electricity.
- ✓ Build houses so that they let in sunlight during the daytime reducing the need for artificial lighting.
- ✓ Use sodium vapour lights for street lighting; these are more efficient.
- ✓ Keep car engines well tuned and use more fuel-efficient vehicles.
- ✓ Idling the engine for long periods of time wastes a great deal of fuel. This can easily be avoided, especially at crossings and during a traffic jam by switching off the engine.
- ✓ Form car pools and encourage parents and friends to do the same.
- ✓ Cycle or walk to the neighbourhood market.
- ✓ Manage vehicular traffic better to reduce fuel consumption and hence pollution. France and Italy have 'No Car Days' and have limited city parking to alternate days for odd- and even-licensed numbers.
- ✓ Turn off all lights, television, fans, air conditioners, computers and other electrical appliance and gadgets when they are not being used.
- ✓ Plant trees in your neighbourhood and look after them.
- ✓ Recycle all cans, bottles, and plastic bags and buy recycled items as far as possible.
- ✓ Generate as little trash as possible, because trash in landfills emits large quantities of methane, and if it is burnt, carbon dioxide is released.

methane and nitrous oxide along with industrial gases. Climatic sceintists are expecting an average temperature increase of between 1.4 C and 5.8 C over the next 100 years. This will also widespread impacts on climatic condition all over the world.

Mitigation Options -

Life style changes can reduce GHG emissions. Changes in lifestyles and consumption patterns that emphasize resource conservation can contribute to developing a low-carbon economy that is both equitable and sustainable. Education and training programmes can help overcome barriers to the market acceptance of energy efficiency. Changes in occupant behabiour, cultural patterns and consumer choice and use of technologies can result in considerable reduction in CO2 emissions related to energy use in buildings. In industries, management tools that include staff training, reward systems, regular feedback, documentation of existing practices can help overcome industrial organisation barriers, reduce energy use, and GHG emissions.

There are multiple mitigation options in the transport sector. Improved vehicle efficiency measures, leading to fuel savings, have net benefits. Biofuels might play an important role in addressing GHG emissions in the transport sector. Modal shifts from road to rail and inland waterway shipping and from low occupancy to high occupancy passenger transportation, as well as land-use, urban planning and non-motorized transport offer oppertunities for GHG mitigation depending on local conditions and policies. Medium term mitigation potential for CO_2 emissions from the aviation sector can come from improved fuel efficiency, which can be achieved through a variety of means, including technology, operations and air traffic management.

At individual level, many options are there which are simple and can save money. Switching off electrical appliances instead of leaving them on standby; buying energy efficient electrical equipment; buying fuel-efficient vehicles; using public transport wherever possible; and re-using and recycling of energy-intensive materials are some options.

Feedback

We would appreciate if you send us comments and suggestions.

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This newsletter is supported by ENVIS, Ministry of Environment & Forests, Govt. of India.