Chapter 6
Social Issues & the Environment.

* Urban problems related to energy.

Energy is one of the main components of development of human society. Every country need energy to maintain physcial comfort & manufacture useful materials & artifacts, for transport, for communications, for agriculture & for industry in general.

In the earlier stages of the industrial revolution, fuel sources were local & widely distributed. A problem related to energy in the present from of industrialization is the centralized nature of fuel production & distribution.

At our present rate of consumption & assuming no population increase, all the known oil reserves could be exhausted by the middle of this century & natural gas by 2070. Coal supplies will last roughly for 200 years at current consumption rates.

* High energy consumption

Urban areas are responsible for the bulk of household energy consumption. The fuel which families use in urban areas is dependent largely on income level & the ways they use energy are also very different. when charcoal is the main source of energy, the problem is observed to be worse because of the low efficiency in both the charcoal-making processes in the rural areas & in extracting energy from charcoal, mainly for cooking. Biomass fuel not only provides energy for poor rural populations, but also to people with higher incomes.

The energy demand of the individuals & community in urban area is very high especially for food & lightening due to the different life patterns. The energy is also required in high quantity to support the needs of high density population such as water storage, street lightening, lifts, shops, holdings & many other community places.

Due to limited use of LPG in the households, use of electricity has become very important in the urban areas. The power failure or frequent interruptions in supply are not affordable to the businesses, many make provisions for stand by generators run on petrol, kerosene or LPG.

Commercial establishments respond to power cuts by using generators, which not only increases costs but also contributes significantly to air & noise pollution.

In fact, air pollution caused by diesel powered generators is a major concern today. Use of power generator sets is also highly fuel consuming. The alternative sources of energy like solar are not still affordable due to their high costs.

With increase in income, the demand for energy evolves from basic energy end uses, such as cooking & lighting, communication, space conditioning & entertainment, all of which need larger quantities & different forms of energy.

Legal supply of electricity is still a distant dream for many urban poor families. It is common to see light switched 'ON' in public or government institutions during the day.

The energy conservation measures can be applied in following ways.

> Promotion of new techniques to reduce energy consumption especially high energy demanding consumers.

> Legal requirement of energy audits to be carried out by major energy consumers.

> Reducing the demand for stolen electricity with strict rules & monitoring.

> Promoting community participation for energy conservation

> Actively promoting the use of energy efficient appliances.

> Encouraging the purchase of energy efficient equipment.

> Promoting the construction of energy efficient buildings.

* Water conservation, watershed management, Rain water harvesting

Fresh water is one of precious natural resources. WHO estimates that 8 % of diseases in third world countries are caused by lack of hygienic conditions, lack of clean drinking water & improper sewage disposal. Hence clean drinking water supply is of the highest priorities in many developing countries.

Water shortages are getting worse as surface water sources are not utilised carefully & as aquifers are depleted. Water conservation is the most effective means of increasing fresh water supply in many areas. Rational use of water resource by reduced use, recycling, reuse in the activities like irrigation, industrial processes & domestic use can easily be implimented.

Water conservation

Number of water conservation measures are practiced in different places depending on availabity of water, local requirements & traditions.

Some of measures are as follows -

> Retention of rainwater from surface through construction of reservoirs, tanks.
> for ground water recharge, construction of check dams, percolation tank.
> for agriculture water management use of lift irrigation, drip & sprinklers for irrigation.
> other water conservation measures include recycling of waste water after proper treatment, reduced use of water, rain water harvesting, recharging ground water, watershed management.

Catchment Area

It is the surface area from which run off rainwater is collected. It can be roof top area of terraces or buildings or designated ground area. The catchment area of housing or society can be increased by connecting the water collection network by pipeline.

The factors affecting run-off are as follows -

> Intensity of rainfall, duration of rainfall, timing of rain i.e first rainfall, during next rainfall

> Surface characters such as smooth surface, rough surface.

Watershed management

When the rain, sleet, snow & other forms of precipitation falls on land. Some water soaks into the ground & become part of ground water.

The remaining in surface water, which runs down the mountains, hills & across the plains as small streams. These small streams come together & form a large stream & eventually join to form a river.

Defn > Conservation or collection of water at a common point.

> Watershed is also called as the area of land that is drained by river, stream or lake.

The watershed management is based on -

basin morphology, drainage pattern, size, shape, slope of watershed, vegetation cover, climatic conditions, characteristics etc.

It is conducted by team of experts from various disciplines like hydrology, geology, engineering, agriculture, economics, soil sciences etc.

It included soil conservation measures, terracing,

contouring, tree plantation, etc.

Rainwater Harvesting

This methods are used almost about 4000 yrs in drier regions. These methods are practiced, envolved & perfected in the regions with less annual rainfall. Only after the piped water was made available to the towns & cities these practices were neglected along with the age old.

Though India has enough surface runoff & ground water as fresh water resources, it is limited, site specific, also there is a problem of water pollution.

Def^n Rain water harvesting means 'catch water where it falls'. Collection of precipitation water during monsoon & other rains & storing it for use during the rest of the year is known as rain water harvesting.

The rain water harvesting is possible from any surface which is from pollution like roof top of house, agricultural field or surface of ground.

There are two rainwater harvesting systems-

> Rain water harvesting from rooftops into tanks.

> Rain water harvesting from surface of ground in underground tank.

Rooftop rainwater is stored in tanks & used for day to day purpose, where rain water is collected from house or building roof tops in storage tank. It is called roof top harvesting.

If surface run off water is collected in under ground tank, it can be used for domestic, agricultural & other purposes.

Community rooftop harvesting, storage & recharging

Amount of rainfall x rooftop area = volume of water harvested (meter^2) (meter^3)

Collection system

It is a system where collection & storage of rain water is done with minimum quantitative losses. It includes collection channels, pipes, tanks, pits or natural depression. Collected water can be used for various purposes by means of channel, pipes, perforated pipes or drip irrigation.

Benefits of rainwater harvesting

> Provides pure & clean quality of water if it is collected from clean surface at low cost.
> Reduce dependance on water from dams, reservoirs & other systems due to direct capturing of rainwater.
> Exert less pressure or reduce pressure on natural water storage capacity.
> Reduce soil erosion & flooding.
> Increase ground water recharge.
> Women & children save their time spent for water collection & reduces health problems.
> Less/No charges of electricity, distribution system as water can be stored near individual houses & housing complexes.

* Climate change, Global Warming, Acid Rain, Ozone layer depletion, Nuclear Accidents & Holocaust.

Climate change

The Earth's climate is vastly different now from what it was 100 million years ago. Though the changes in Earth's climate in the distant past were driven by natural causes, such as variations in CO_2 content of the atmosphere & other natural consequences.

Present as well as future climatic changes will probably have another source, i.e human activities. Human can directly or indirectly alter the natural flows of energy enough to create significant climatic changes. This natural phenomenon allows solar energy to reach the Earth's surface & warm the climate. Gases such as water vapour CO_2 trap large fraction of long wavelength radiant energy called terrestrial infrared radiation near Earth's surface.

This green house effect is responsible for 33°C of surface warming. The small human induced changes to the natural greenhouse effect are typically projected to result in a global warming of 1°c to 5°c in the next century. This could result in an ecologically significant change.

Dry weather has aggravated forest fires causing huge damage of property & wildlife. Globally sea level has risen. Worldwide frequency of extreme rainfall events has increased.

Global warming

Atmospheric concentration of CO_2 & other greenhouse gases released by human activities, such as burning of fossil fuel & deforestration are increasing the Earth's temperature. The mechanism commonly known as the green house effect is what makes the Earth habitable.

These gases in the atmosphere act like the glass of green house, letting sunlight in & preventing heat from escaping.

But human activities have increased the concentration of greenhouse gases like carbondioxide, methane, nitrous oxide which also have altered the chemical composition of atmosphere. The heat trapping property of these gases is undisputed although how exactly earth's climate will respond to them is not cleared.

Changing Atmosphere

Energy from sun & its intensity drives the Earth's weather & climate also heats up the Earth's surface, the Earth radiates energy back into space. Atmospheric greenhouse gases trap some of the outgoing energy.

Without this natural 'greenhouse effect' temperatures would be much lower than they are now. These greenhouse gases keeps earth's average temperature more hospitable at 30-35°C. But the problem may rise when the atmosperic concentration of greenhouse gases increases.

The atmospheric concentrations of CO_2 have increased by 30 %, methane more than doubled & nitrous oxide about 15%. These increases have enhanced the heat trapping capability of earth's atmosphere. According to scientist the greenhouse gas concentrations are increasing, due to combustion of fossil fuels & other human activities.

In last few hundred years there is additional release of carbon dioxide by human activities. Increased agriculture, deforestration landfills, industrial production & mining also contribute a significant share of commissions. Decreasing forest & natural vegetation.

Greenhouse Gases

Greenhouse gases occur naturally in the atmosphere & other result from human activities. Naturally occuring green-house gases are water vapor, Co_2, methane, NO_2 & ozone. Certain human activities results to add the levels of most of these naturally occuring gases.

CO_2 - is released to atmosphere when solid waste, fossil fuels, coal, natural gas, coal & wood & wood products are burned.

Methane - is from the production & transport of coal, natural gas & oil. It also emittes from the decomposition

of organic waste in agriculture, in municipal solid waste, landfills & raising of livestock.

Nitrous oxide - is released during agricultural & industrial activities as well as during combustion of solid waste & fossil fuels. Very powerful greenhouse gases are hydro flurocarbons (HFC_s), perfluro-carbons (PFCs) & sulfur hexafluroide (SF6) which are generated from various industrial processes.

The ability of green house gases to absorb heat in the atmosphere differs. Methane traps more than 21 times heat per molecule than CO_2, Nitrous oxide absorbs 270 times more heat per molecule than CO_2.

Increasing concentrations of greenhouse gases are likely to accelerate the rate of climate change. Experts expect that the average global surface temperature could rise 0.6-2.5°C in the next fifty years, & 1.4-5.8°C in the next century, which will give rise to significant regional variation.

The changes in global temperature could introduce new infectious diseases. The crop yield could be effected, the ground water balance may be changed, indirectly effecting the quality of human life, ecosystems.

Acid Rain

Acid rain includes various ways of acid fall from the atmosphere. In precise term it is known as acid deposition, which is of two forms wet & dry. The wet deposition is acidic rain, fog & snow. This acidic water flows over & through the ground & it effects on variety of plants & animals life.

The dry deposition means spread of acidic gases & particles. Nearly half of the acidity in the atmosphere falls back to earth through dry diposition.

Scientists have discovered that sulphur dioxide & nitrogen dioxide are primary causes of acid rain. When these gases react with water vapor, oxygen & other chemicals to form various acidic compounds like mild solutions of sulphuric acid & nitric acid.

Effects of acid rain

It damages to forest, soil, fish & other living organisms in the food chain, materials & human health. Acid rain causes acidification of lakes & streams & causes damage to trees at high elevations & other sensitive forest soils.

The effects of acid rain are seen on aquatic environment such as streams, lakes & marshes. Acid rain flows to streams, lakes, marshes after falling on forests, fields, buildings & roads. Most lakes & streams have a pH between 6 & 8. Acid rain primarily affect the watershed of lakes. In areas where buffering capacity is low, acid rain also releases aluminium, from soils into lakes & streams which is highly toxic to many species of aquatic organisms.

Acid rain does not directly kill the trees. It weaken the trees by damaging their leaves, limiting nutrients available to them or exposing them to toxic substances slowly released from the soil. As result of this trees get injury or they get dead.

Dry deposition of acidic particles contribute to corrosion of metals & the deterioration of paint & stone. The pollutants such as SO_2, NO_2 interact in atmosphere to form fine sulphate & nitrate particles. If pollution control technologies are used damage from acid rain may be minimised.

e.g burning of natural gas emits less SO_2 than coal burning

Ozone layer depletion

The presence of ozone in the stratosphere is a function of altitude, latitude & season. It is located in between 10 to 50 km above the Earth's surface & contains 90 % of all stratospheric ozone.

Under normal condition stratosphere ozone is formed by a photochemical reaction between oxygen molecules, oxygen atoms & solar radiation.

Ozone molecule contains three oxygen atoms. It is blue in colour & has strong odour. Normal oxygen, has two oxygen atmos & is colourless & odorless. Out of each 10 million air molecules, about 2 millions are normal oxygen but only 3 are of ozone. But a small amount of ozone plays a key role in the atmosphere. The ozone layer absorbs the portion of UV light called UVB. UVB has been linked to many harmful effects including various types of skin cancer, cataracts & harm to crop & some forms of marine life.

Naturally ozone molecules are constantly formed & destroyed in the stratosphere & total amount remains relatively stable. The ozone concentration vary naturally with sunspot, seasons & latitude.

The ozone layer is essential to life on earth. In recent years the thickness of this layer is decreasing. More than 95 % of the ozone concentrations found at altitude between 15 to 20 kms & more than 50 % of total ozone are destroyed. This reduction is seen during the winter & early springs. More than 1-2 % of ozone levels are decreased by natural phenomenon like, sun-spot & stratospheric winds.

Aircraft emissions of nitrogen oxide & water vapour add to depletion. Along with this the large volcanic eruptions can have an indirect effect on ozone levels.

Consequences of ozone depletion

Earth's ozone layer protects all life forms the sun's harmful radiation. But the degradation of ozone layer due to human induced activities likely to make following damage -

1. 1% loss of ozone layer leads to 2% increase in UV radiation. Continuous exposure to UV radiation affects humans, animals, plants & can lead to skin problems
2. Increased UV radiation may also lead to massive die-off of phytoplanktons & therefore to increase global warming.
3. Ozone is considered as a green house gas. So, reduction of ozone will reduce green house effect upto some extend.

* Wasteland reclamation

Productivity of this land is far below its production potential. Also some of the forest land is also being degraded & now can be added into the category of early wasteland. Approximately 73.6 million hectares land has become wasteland due to water erosion.

Concept of wasteland

Wasteland is defined as the land which is degraded & is presently lying unutilised except as current follows due to different natural or human dominated constraints. wastelands could be considered as those lands which are unutilised, partially utilised for any productive purposes. With increase in total wasteland, the environment becomes unstable & the natural balance gets disturbed. Therefore there is an urgent need to ensure environmental stability & ecological balance.

Classification of wasteland

Wastelands are classified into two classes as culturable wastelands & non-culturables wastelands. Wasteland could be either state or under private occupation or notified forest area. In the country, a large area is not yielding the desired rate of production due to different factors like soil erosion, water logging, shifting cultivation. Such damage to the land caused is of permanent nature at many places. The pressure of increasing population on limited productive lands is ever increasing. The consequent reduction of land-man ratio is making it imperative to launch a developmental programme for these lands to meet the end objectives of self-sufficiency in food, fodder, timber & ecological balance by undertaking different initiatives.

Unculturable wastelands

Lands, which have no capacity to develop natural vegetative cover, are defined as unculturable wastelands. Most of these are difficult to bring under cultivation.

Major causes leading to wasteland

> Due to increasing population pressure agricultural expansions is taking place. It is leads to deforestation for additional agriculture land. As a result, soil erosion is increasing & the quality of soil is decreasing.
> The uncontrolled grazing by less productive livestock is leading to increased total wasteland area.
> There is growing demand for fuel wood in the country.
> Shifting cultivation is another major reason for increasing wastelands in the hilly regions.
> Various developmental activities like mining & road development are also leading to the wastelands due to disposal.

> Pattern of monoculture in agricultural practices many times makes the land deficient in nutrients & the land becomes a wasteland.
> Excess use of fertilizers & excess irrigation also has resulted into the saline lands & finally into agricultural wastelands.