CBCS SCHEME

USN | | | | | | | | | | 18ME751

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Energy and Environment

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. List and explain different forms of Energy. (10 Marks)
b. Explain briefly the factors affecting India's Energy development. (10 Marks)

OR

2 a. Discuss briefly the Demand and Consumption of coal in India. (10 Marks)
b. Explain the various key Energy trends in India. (10 Marks)

Module-2

3 a. Explain various Thermal Storage Systems. (10 Marks)
b. Explain the principles of Energy Management System. (10 Marks)

OR

4 a. Define Energy Audit and explain different phases involved in detailed Energy Audit Methodology. (10 Marks)
b. What is Energy Management? Explain Energy Management System and Energy Management Clarified Objectives. (10 Marks)

Module-3

5 a. What is Environment? Explain its Multidisciplinary Nature. (10 Marks)
b. Explain Scope and importance of Environment for Public awareness. (10 Marks)

OR

6 a. Explain structure and functions of Ecosystems. (10 Marks)
b. Write a short note on : i) Ecological Pyramid ii) Forest Ecosystem. (10 Marks)

Module-4

7 a. Discuss the causes, effects and control measures of Water Pollution. (10 Marks)
b. Discuss Solid Waste Management Techniques. (10 Marks)

OR

8 a. Explain the causes, effects and control measures of Soil Pollution. (10 Marks)
b. Discuss the role of an Individuals in Preventions of Pollutions. (10 Marks)

Module-5

9 a. Write a note on : Ozone Layer Depletion. (10 Marks)
b. What are the Regulation governing for Water Pollution Prevention Act? (10 Marks)

OR

10 a. Write a short note on : i) Global warming ii) Acid rain. (10 Marks)
b. Explain the needs for Reclaiming the wasteland and its development. (10 Marks)

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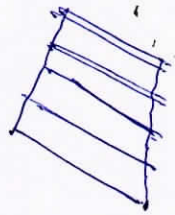


Basic Introduction to Energy

1 (a)

Energy is the capacity to do work.
Unit is Joules

Power is the rate at which work is done or energy is transmitted
Unit is Joules/second

Forms of Energy

(1) Potential Energy
(2) Kinetic Energy
(3) Chemical Energy
(4) Gravitational Energy
(5) Thermal Energy
(6) Mechanical Energy
(7) Electrical Energy
(8) Nuclear Energy
(9) magnetic Energy
(10) Elastic Energy
(11) Sound Energy
(12) Light Energy
(13) Solar Energy
(14) Hydroelectric Energy
(15) Wind Energy
(16) Nuclear Energy
(17) Tidal Energy
(18) Biomass Energy
(19) Geothermal Energy
(20) Internal Energy
(21) Atomic Energy
(22) Radiant Energy
(23) Electromagnetic Energy

All forms of Energy are inter-convertible by appropriate process.

Energy either exists in the earth or comes from the outer space.

The energy existing in the earth is known as capital Energy & sources mainly fossil fuels, Nuclear fuels.

The energy comes from the outer space called celestial energy & sources mainly solar, wind, tidal, geothermal, biofuel etc.

Primary Energy sources

These Energy sources can be used directly, as they appear in the natural environment like, coal, Oil, Natural gas & wood, Nuclear fuels (uranium), the sun, the wind, tides, the rivers, geothermal Energy (Earth heat)

Secondary Energy sources

These Energy sources derived from the primary energy sources

ex:- Petrol derives from the crude Oil

~~mechanical~~ Electric Energy derives from mechanical energy

Energy flows

Energy flow may refer to : Energy transfer, the transfer of physical Energy from one body or place to another.

ex:- Energy flow (ecology), the flow of energy through a biological food chain

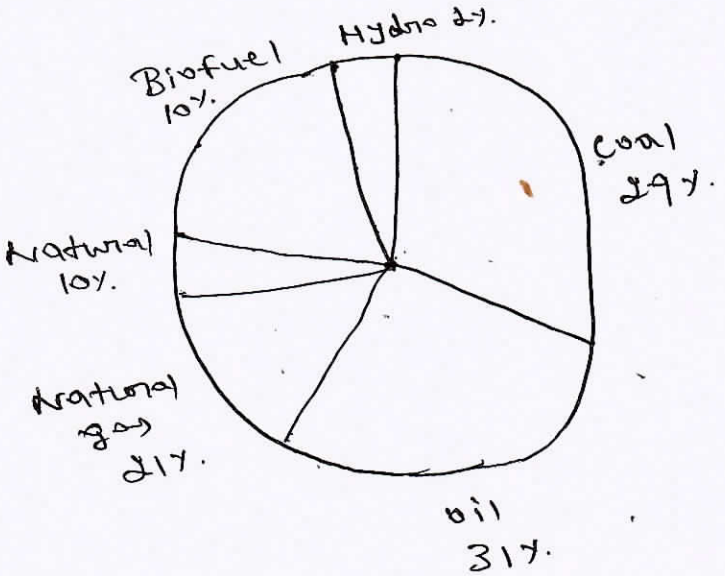
Fluid dynamics, Energy of a flowing fluid related to pressure.

2 (a)

World Energy production & Consumption

Production

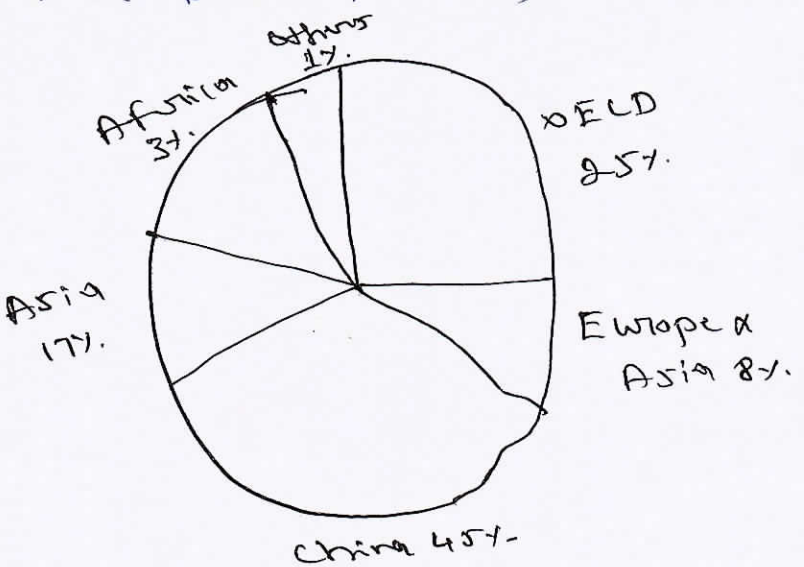
The global energy production at the end of 2014 was equivalent to 14000 million Tonnes of oil equivalent (MTOE). Coal Accounted for 29%. oil 31%, Natural gas for 21% & other at 18%. (including nuclear, hydro, biofuels etc).



Coal

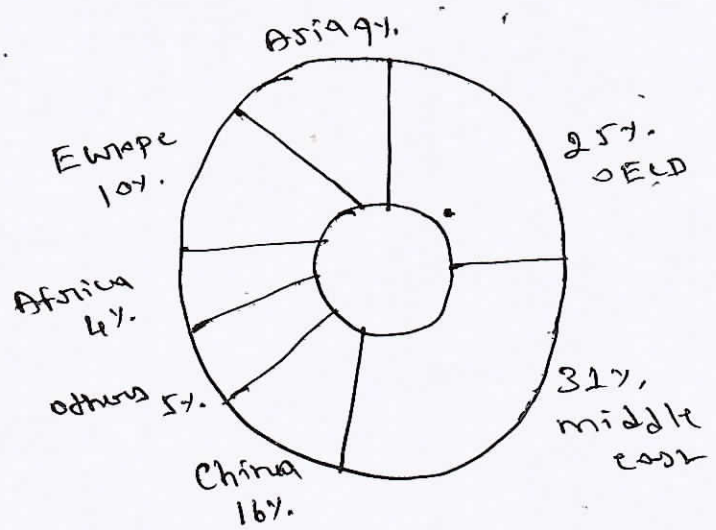
Global coal production stood at 7700 MTOE as on 2015. Global coal production fell by 4%. when compared to historical data.

China accounted for a larger share with about 46%., other Asian countries about 17%., OECD (organisation for economic co-operation & development) countries about 25%.



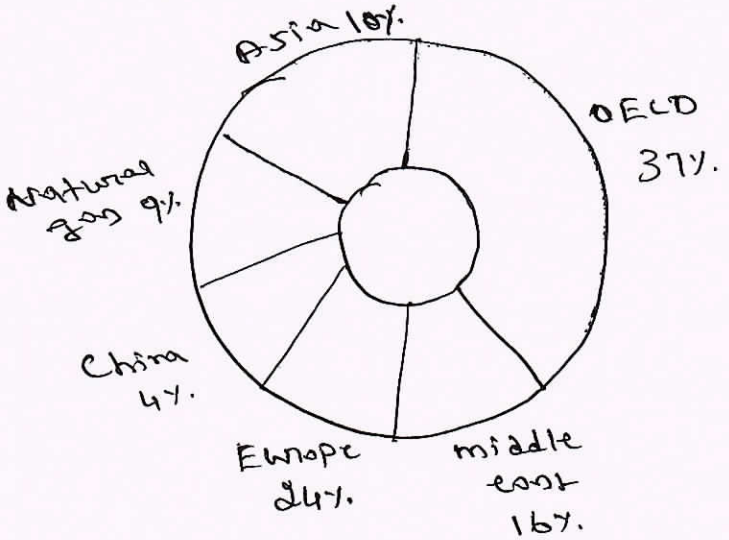
Oil

Global oil production stood at 4300 MTOE as on 2015. Global oil production increased rapidly (3.2%). middle east accounted for about 32%., Europe & Asia about 16%., America about 9%. compared to historical data.



Natural gas

Global natural gas production stood at 4000 billion cubic meter (bcm) as on 2015. Global production grew by 2.2%. compared to historical data. OECD countries accounted for 37% share while Europe & Eurasia 24%, Asia about 9%.



consumption

Global energy consumption was 9425 MTOE as on 2014. oil accounted for 40%., Electri-city about 18%., natural gas about 15%. coal about 11%.

Developed countries are consuming more energy with energy demand continues to grow strongly.

Renewable sources will gain importance & energy system will become more complex rapidly.

Energy efficiency is crucial in dealing with demand outstripping supply.

Investment should be huge with focus on requirement of solid ecological arrangement.

2(b) Key energy trends in India

* Demand * Electricity * Access to modern Energy * Energy production & trade

Demand

* India has been accountable for virtually 100% of the rise in international energy demand since 2000.

* Its energy demand during this amount has virtually doubled, pushing the country share in International demand up to 5.7% in 2013 from 4.4% at the start of the century.

* Expressed on a per-capita basis, energy demand in our country has fully grown by 46% since 2000 & remains only around $\frac{1}{3}$ of the world average.

Electricity

* The country's electricity demand in 2013 was 897 terawatt hours (TWh) up from 376 TWh in 2000, having risen over this period at an avg annual rate of 6.9%.

* Electricity now constitutes some 15% of final energy consumption since 2000.

* on the supply side, India has some 290 gigawatt of power generation capacity, of which coal (60%)

Access to modern Energy

India has made great strides in improving access to modern energy in recent years.

Since 2000, India has more than halved the number of people without access to electricity & doubled rural electrification rates.

Around 20% of the population, remain without access to electricity.

India's rural electrification programme The Rajiv Gandhi Grameen Vidyutikaran yojana (RGGVY), was launched in 2005 & aimed to provide electricity to villages of 100 inhabitants or more & free electricity to people below the poverty line.

In July 2015, RGGVY was subsumed within a new scheme, the Deen Dayal Upadhyaya Gram Jyoti yojana (DDUGJY) The main components of this scheme are the separation of distribution networks between agricultural & non-agricultural consumers to reduce load shedding, strengthening local transmission & distribution infrast-ructure & metering.

Energy production & trade

Coal

* India has the third largest hard coal reserves in the world (roughly 12% of the world total), as well as significant deposits of lignite.

* Yet the deposits are generally of low quality & India faces many obstacles to the development of its coal resources.

* In 2013, India produced almost 340 millio tonnes of coal equivalent but it also imported some 140 Mtce.

Oil & oil products

* India is one of the few countries in the world that rely on imports of crude oil while also being significant net exporters of refined products

* India has relatively modest oil resources & most of the proven reserve (around 5-7 billion barrels) are located in the western part of the country notably in Rajasthan & in offshore areas near Gujarat & Maharastra.

* most of the remaining production comes from joint ventures with the national oil & gas companies under successive licensing.

Natural gas

Natural gas has a relatively small share (6%) of the domestic energy min. Production of conventional gas reached 34 bcm in 2013 & was supplemented by LNG imports.

The navarity state owned gas company Gail, is the largest player in the mids -tream & downstream gas market.

1(b) ## Factors Affecting Indian energy developmen

The various factors that affect our country's energy development are

* Energy & Demographics
* Policy & Institutional Framework
* Energy prolers & affordability
* Social & environmental aspects
* Investment.

Energy & Demographics

* India's economy has grown at an average rate of 6.5% a year, second only to China among the large emerging economies & two-& - a half times the global avg.

* India alone has accounted for over 9% of the increase in global economic output since 1990

* Despite this progress, income per capita is still low & a gap has emerged between India & its counterparts.

* Services sector has been the major driver of growth in India economy accounting for around 60% of the increase in GDP between 1990 & 2013.

* The government has expressed its intention to re-balance the economy & announced the "Make in India" initiative with an intention of increasing the share of manufacturing in GDP to 25% by 2022 & creating 100 million jobs in the process.

* The service sector employs only around one-quarter of the labour force. The agricultural sector, with less than 20% of GDP (compared with just over 35% in 1990), continues to account for around half of total employment as shown below.

Policy & institutional Frame Works

* The direction that national & State policies take & the vigour & effectiveness with which they are implemented, will naturally play a critical role in India's energy outlook & has few policies listed such as Integrated energy policy 2008, National Action plan on Climate change, planning commission [now the national Institution for transforming India [NITI Aayog]

Some key aspects of the emerging energy vision are

* A commitment to the efficient use of all types of energy in order to meet rapidly growing demand.

* Increase the target for renewables to 175 GW by 2022

* Reorientation of energy subsidy programmes

* A drive for market-oriented solutions & increased private ~~investment~~ investment (including foreign investment) in energy both through some energy-specific reforms

* Twin energy-related commitments to increase the share of non-fossil fuel power generation capacity to 40% by 2030 & to reduce the emission intensity of the economy by 35% by the same date measured against a baseline of 2005.

Energy prices & Affordability

The relationship between income levels, energy prices & energy expenditure is fundamental to the evolution of india energy system.

Energy consumption increases with income level of consumption & the fuel choice are also affected by location.

Household expenditure on energy is on avg almost two & a half times higher in urban centres than in rural areas.

Eni:- LPG:- the government is committed to make them more efficient through the use of AADHAAR.

Social & Environmental Aspects

Pollution

India is burning more fossil fuels & biomass than it has at any other time in the past, releasing more pollutants, including fine particulate matter & sulphur & nitrogen oxides into the air.

Estimated that life expectancy as a result is reduced by 3.2 years for each person living in these areas.

Land

* Welfare of India's rural population is closely linked to the amount of land they have available for productive use.

* land acquisition for public or private enterprises wishing to build infrastructure from roads & railways to power plants & steel mills, is therefore an issue.

* Legislative changes introduced in 2013 introduced stringent procedural requirements for land acquisition.
  Some of the measures include.
  1. Defining compensation payments
  2. Rehabilitation & resettlement benefits.
  3. Need to secure the consent of 80% of affected families in the case of land acquisition.

Water

High rates of population & economic growth along with highly inefficient patterns of water use in the agricultural sector are putting severe strain on india's water resources.
Around 90% of India's water withdrawal is for use in agriculture & livestocks.

Investment

Since 2000 investment in energy supply in India has increased substantially, reaching almost $77 billion on avg since 2010 with power sector absorbing the largest share. India government aims to increase investment in infrastructure to 8.2% of GDP from roughly 7.2% in 2007 - 2011.

2014 significant increase in FDI inflows which rose by 22% compared to the previous year.

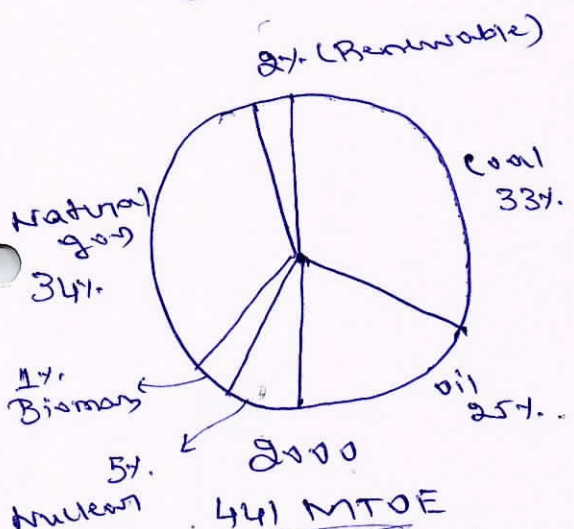
Key energy trends in India

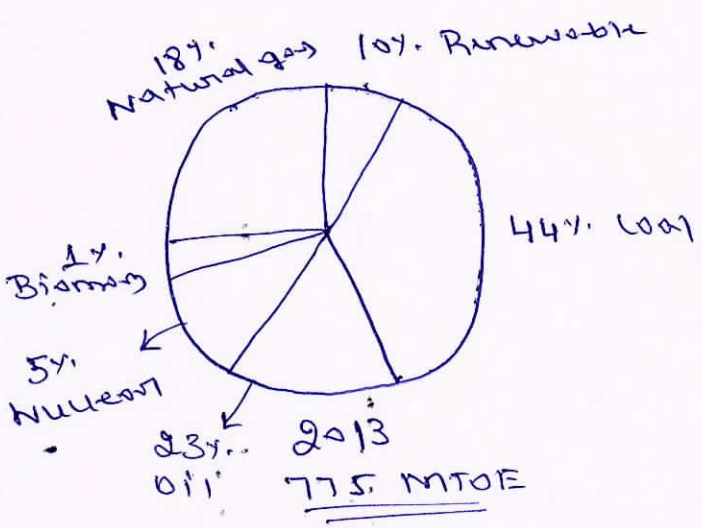
The various key energy trends in India include

* Demand
* Electricity
* Access to modern energy
* Energy production & trade

Demand

* India has been accountable for virtually 100% of the rise in energy demand since 2000.





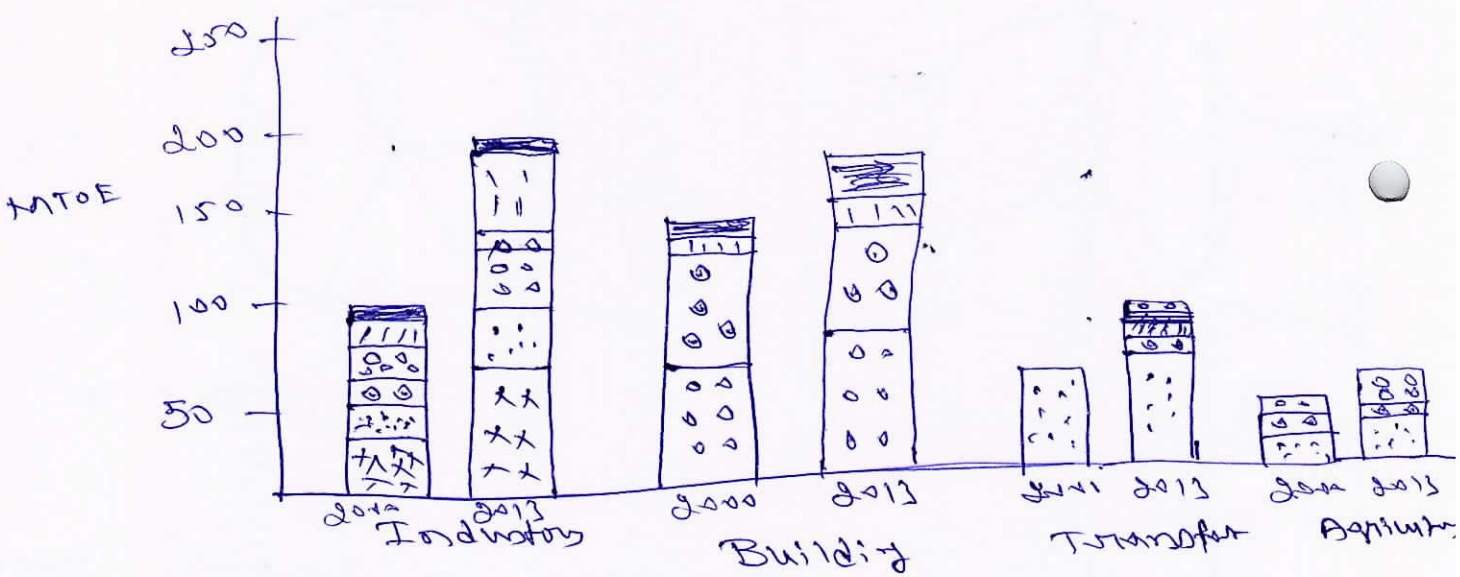
* Almost three quarters of Indian energy demand is met by fossil fuels, a share that has increased since 2000 because of a rapid rise in coal consumption.
* Coal now accounts for 44% as on 2013

* Coal contributed to its wise in the power sector.

* Oil consumption in 2013 stood at 3.8 million barrels per day, 40% of which is used in the transportation sector.

* Hydropower, nuclear & modern renewables (solar, wind & geothermal) are used predominantly in the power sector but play a relatively small role in the total energy mix

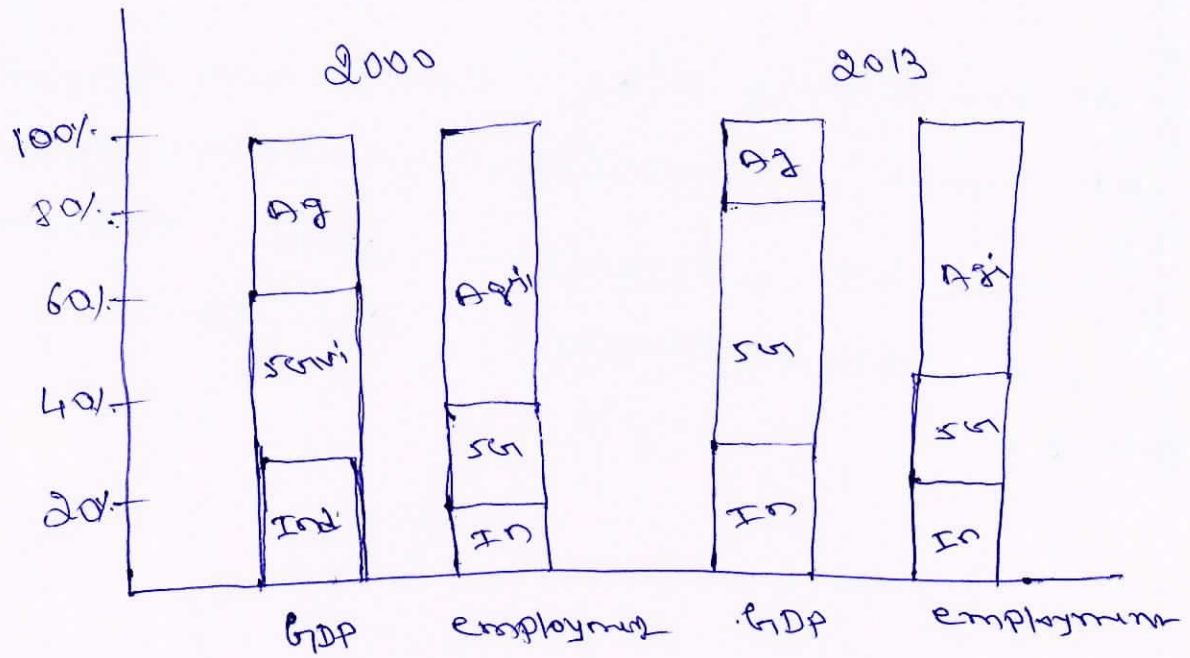
Sector wise comparison



xxx → Coal
:: → Oil
OO → Gas
oo → Electricity
||| → Biomass
▭ → Other Renewables

Energy production & trade

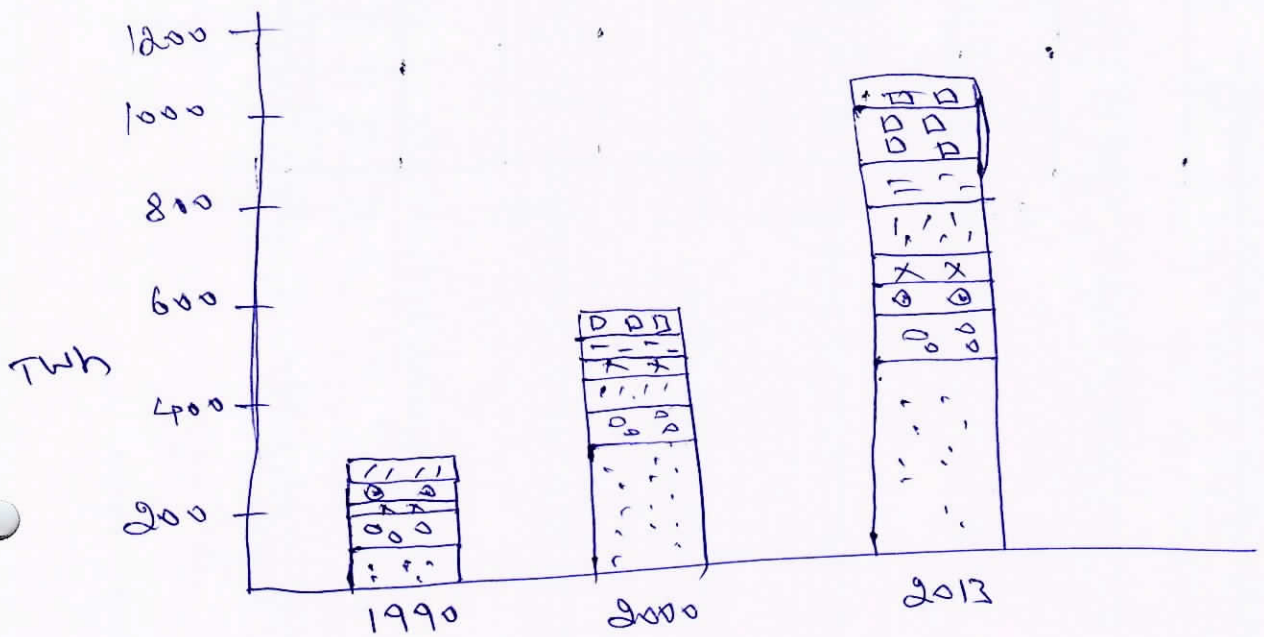
Energy & Demography



Electricity

* The country's electricity demand in 2013 was 897 terawatt hours (TWh) up from 376 TWh in 2000.

* on the supply side, India has some 897 twh of power generation capacity of which coal 60%, hydropower 20%, natural gas 8%, 10% renewable, 05% Oil



→ coal

→ Oil

→ Nuclear

→ Gas

→ Hydro

→ Bio

→ Renewables

- Energy storage systems

3 (a)

Energy storage has only recently been developed to a point where it can have a significant impact on modern technology. In particular, ES is critically important to the success of any intermittent energy source in meeting demand.

Energy storage systems can contri-buter significantly to meeting society needs for more efficient, environ-mentally benign energy use in buildings heating & cooling, aerospace power, & utility applications. The use of ES systems often results in such benefits as

* reduced energy cost
* reduced energy consumption.
* improved indoor air quality
* reduced initial & maintenance costs

Thermal energy storage

* Thermal storage for HVAC application storage at various temp associated with heating or cooling

* The collection of heat from solar energy for later use, hours, days or many months later, at individual building, multiuse building.

Thermal storage systems

(1) Cold storage :- storage receiving & accumulating cooling capacity output from the refrigerant plant.

(2) Solar Storage :- Solar collector along with its associated pump to convert solar radiation into heat

(3) packed ~~be~~ Rock beds :-

A packed rock bed utilizes the available thermal energy by means of circulating through a packed bed to add heat or remove heat from the system for charging & discharging resp.

(4) Sensible heat storage :-

A heat storage systems that uses a heat storage medium & where the additional or removal of heat results in a change in temp.

(5) Latent heat storage :- A heat storage systems that uses the energy absorbed or released during a change in phase, without a change in temp.

Energy savings

Thermal energy storage (TES) is a key component of many successful thermal systems. TES should allow for the minimum reasonable thermal energy losses & the corresponding energy savings. while permitting the highest appropriate extraction effitiency of the stored thermal energy.

TES can be employed to reduce energy consumption or to transfer an energy load from one period to another.

Energy load transfer can be achieved by storing energy at a given time for later use & can be applied to TES for either heating or cooling capality.

3 (b) Energy management

* Utilization of minimum quantity of energy for a task at an appropriate quality neither better nor worst than needed. "task in energy use"

* To minimize the energy cost without effecting production & quality

* Energy forms of high quality/grad shouldn't used for low grade applications

Principles of energy management

* Historical energy use
* energy Audit
* Home keeping & maintenance
* Analysis of energy use
* more efficient equipments
* more efficient process
* Alternate energy source
* manage the energy at the highest energy efficiency
* use most appropriate technology
* Reduce the available losses.

4(b) Energy Demand estimation

Energy Demand estimation means managing of the demand for power, by utilities, Distribution companies, among some or all its customers to meet current or future needs.

EDE programmes result in energy & demand reduction. Under this process the demand can be shifted from peaks to off peak hours thereby reducing the need for ~~buy~~ buying expensive imported power during peak hours.

Energy Auditing

energy cost is vital factor for awareness creation & saving calculation. In many industries sufficient meters may not be available to measure all the energy used. In such cases invoice for fuels & electricity will be useful.

The annual company balance sheet is the other source where fuel cost & power are given with production related information.

Energy invoices can be used for the following purposes

* They provide a record of energy purchased in a given year, which gives a base line for ~~for~~ future reference.
* When electricity is purchased on the basis of maximum demand tariff.
* They can suggest where savings are most likely to be made.

4(a) **Energy Audit: Types & methodology**

Energy Audit is the key to a systematic approach for decision making in the area of energy management.

It attempts to balance the total energy inputs with its use, & serves to identify all the energy streams in a facility. It quantifies energy usage according to its discrete functions.

Industrial energy audit is an effective tool in defining & pursuing comprehensive energy management programme.

As per the energy conservation Act 2001 energy Audit is defined as the verifica-tion, monitoring & analysis of use of energy including submission of techno report containing recommendations for improving energy efficiency with cost benefit analysis & an action plan to reduce energy consumption

Type of energy Audit

* Function & type of industry
* Depth to which final audit is needed &
* potential & magnitude of cost reduction desired.

Methodology with respect to proven industries

In Industry, the three top operating expenses are often found to be energy (both electrical & thermal), labour & materials If one were to relate to the manageabi-lity of the cost or potential cost savings in each of the above components energy would invariably emerge as

a top ranker, & thus energy management function constitutes a strategic area for cost reduction.

energy audit will help to understand more about the way energy & fuel are used in any industry & help in identify-ing the areas where waste can occur & where scope for improvement exists.

The primary objective of energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs.

Energy Audit provides a benchmark for managing energy in the organiza-tion & also provides the basis for planning a more effective use of energy throughout the organization.

Characteristic method employed in certain energy Industriy

(1) Introduction about the plant
* General plant details & description
* Energy Audit team
* components of production cost (Raw materials, energy chemicals, manpower, overheads, others)
* major energy use & areas.

(2) Production process Description
* Brief description of manufacturing process
* process flow diagram & major unit operation
* major Raw materials Input, Quantity & cost

(3) Energy & Utility system Description
* List of utility
* Brief Description of each utility
* Electricity
* Steam
* Water
* Compressed air
* cooling water
* Chilled water

(4) Detailed Proven flow diagram & energy & material balance

* Flow chart showing flow rate, temp, pressure of all input output streams
* water balance for entire Industry

(5) Energy efficiency in utility & Proven systems

* Specific energy consumption
* Boiler efficiency assessment
* Thermic Fluid Heater performance assessment
* Furnace efficiency Analysis
* D G set performance assessment
* Refrigeration system performance
* Electric motor load analysis
* Lighting system etc

(6) Energy conservation option & Recommendation

* List of option in terms of No cost / Low cost, medium cost & high investment cost, Annual energy & cost saving & payback
* Implementation plan for energy saving measure / proven.

Environment & Ecosystem

5(a) **Environment** :- Environment means anything that surround us. It can be living (biotic) or non living (abiotic) things. It includes physical, chemical & other natural sources.

Defination :-

It deals with each problem that influences an organism. It is essentially a multidisciplinary technique that brings about an appreciation of our natural world & human impacts on its integrity.

5(a) **Scope & Importance**

Surroundings were originally a natural landscape like a forest, a river, a mountain, a desert, or a mixture of those components. Most of us live in landscapes which have been closely changed via human beings.

Daily lives are linked with our environment & inevitably influences them.

Ill effects of rapid financial boom & development brought about environmental degradation. Industrial improvement makes use of up massive amounts of natural resources.

5(b) Need for public awareness

Earth's natural resources are dwinding & our surroundings is being progressively degraded by human activity, it is evident that measures have to be taken. often feel that dealing with all that is someth -ing that the government must do.

Prevention of our surroundings degradation in which we have to all take part that need to become a part of all our lives. As an individual, we are able to play a significant role in environment management.

6(a) Ecosystem

Ecosystem may be a region with a particular & recognizable landscape type like forest, grassland, Desert, land or coastal space

The geographical, climatic & soil traits from its non living (abiotic) factors. The living a part of the environment is called its biotic element. This community of living organisms in connection with the non living parts of their surroundings interact as a system.

Energy flow

Every ecosystem has several interrelated mechanisms that affect human life.

There are the water cycle, the carbon cycle the oxygen cycle, the nitrogen cycle & the energy cycle.

While every ecosystem is controlled by these cycles, in each ecosystem its abiotic & biotic features are distinct from each ~~other~~ other.

water cycle

When it rains, the water runs alongside the floor & flows into rivers or falls directly into the ocean.

A part of the rainwater that falls on land percolates into the ground.

This is stored underground all through the rest of the year.

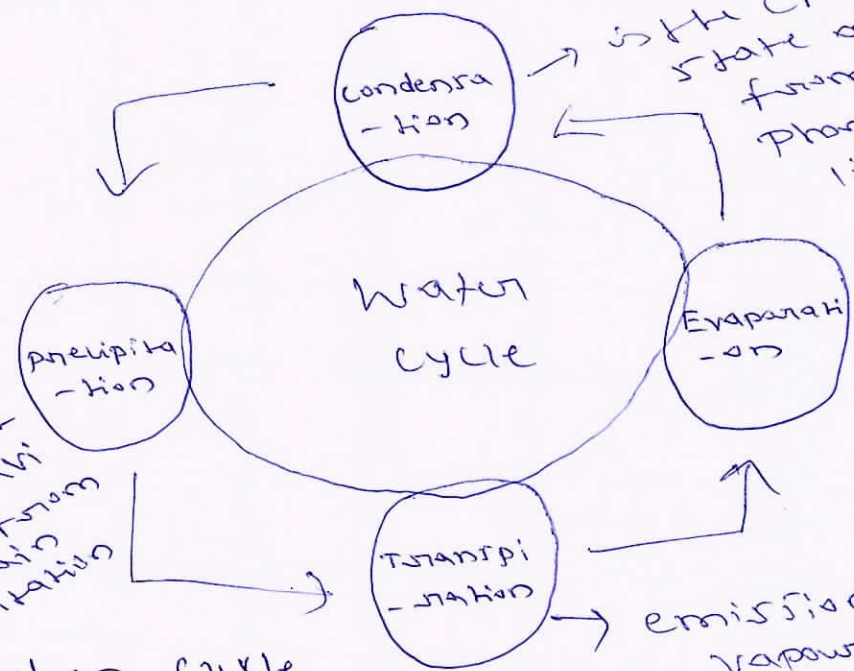
water is drawn up from the ground by plant life together with the vitamins from the soil.

The water is transpired from the leaves as water vapour & returned to the surroun-dings.

The water is transpired from the leaves as vapour & returns back to the atmosphere

Because it is lighter than air, vapour rises & forms clouds.

Wind blow the clouds for long distances & once the clouds rise higher, the vapour condenses & changes into droplets, that fall on the land as rain



Carbon Cycle

The carbon, which occurs in organic compounds, is included in both the abiotic & biotic components of the ecosystem.

Plants use photosynthesis for their growth & improvement.

In this procedure, vegetation releases oxygen into the ecosystem on which animals depend for their respiration.

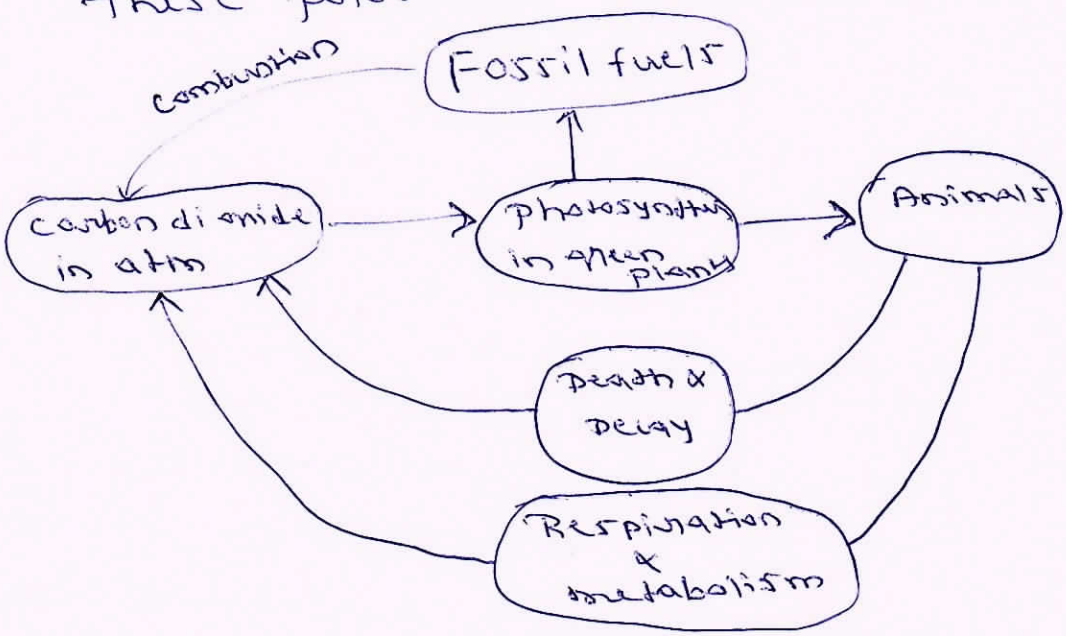
Herbivorous animals feed on plant cloth that is utilized by them for strength & for their improvement.

Both plants & animals release carbon dioxide during respiration.

They also return fixed carbon to the soil in the waste they excrete.

When plants & animals die they return their carbon to the soil.

These processes complete the carbon cycle.



Nitrogen cycle

Carnivorous animals feed on herbivorous animals that eat plants.

When animals ~~defects~~ defecate, this waste material is broken down through worms & bugs typically beetles & ants.

These little soil creatures breaks the waste material into littler bits on which minute microorganisms & organisms can act.

This material is hence separated further into supplements that plants can retain & use for their development.

In this manner supplements are reused once again from creatures to plants. Thus the nitrogen cycle on which life is

dependent is completed

Oxygen Cycle

The oxygen cycle is the biogeochemical cycle that portrays the development of oxygen inside & between its three principle stores: the (air), the biosphere (living things), & the lithosphere (earth's hull

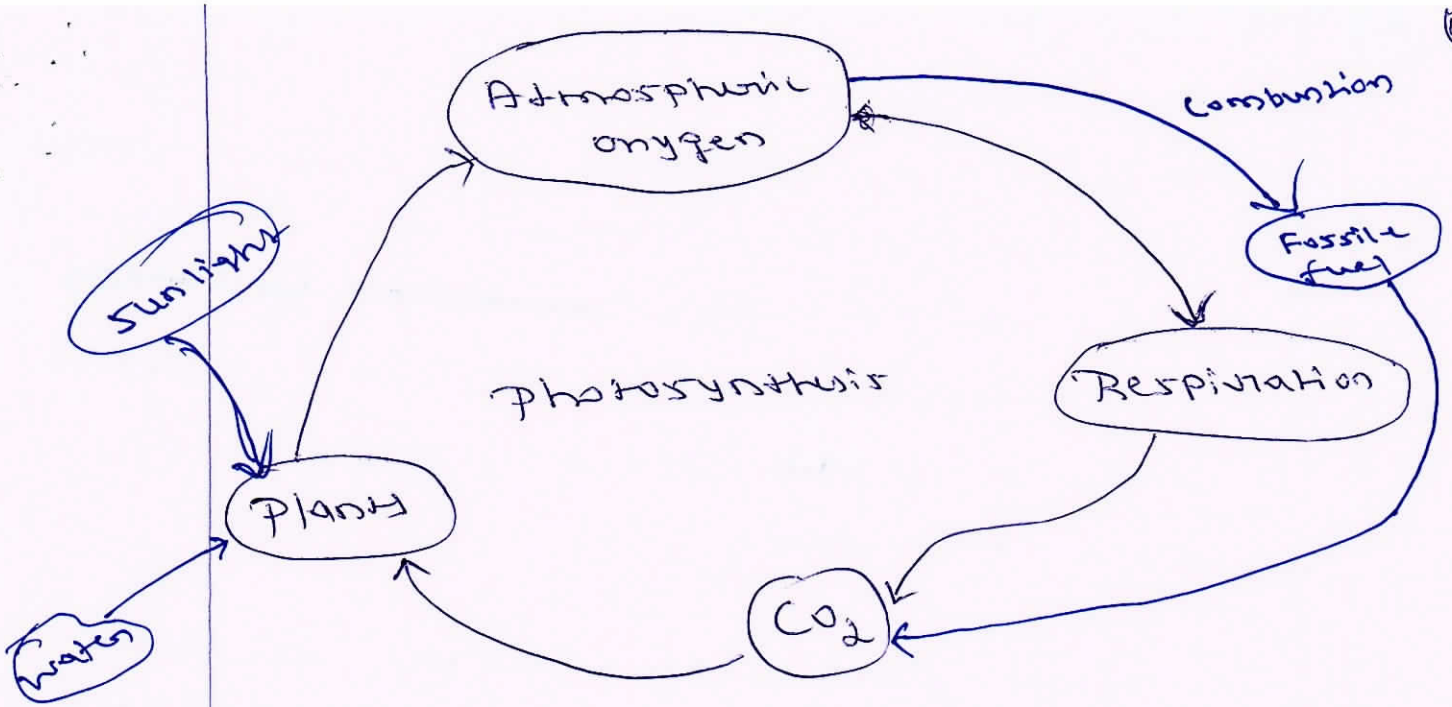
The fundamental driving element of the oxygen cycle is photosynthesis, which is responsible for the modern earth's atmosphere & life.

Plants are the main creators of oxygen within the atmosphere through photosynthesis

Here the three makes use of daylight & carbon dioxide to supply electricity & releases oxygen.

The animals breathe in the oxygen & then breathe out carbon dioxide.

The plant can then use this carbon dioxide & the cycle is completed.



Energy cycle

The energy cycle is based totally on the flow of energy through the surroundings. Energy from sunlight is transformed via plants into developing new plant fabric which includes leaves, plants, fruit, branches, trunks & roots of vegetation, referred to as producers in the ecosystem.

The herbivorous animals feed on these plants. The carnivores in turn depend on herbivorous animals on which they feed. Thus the unique plant & animals species are linked to one another through food chains.

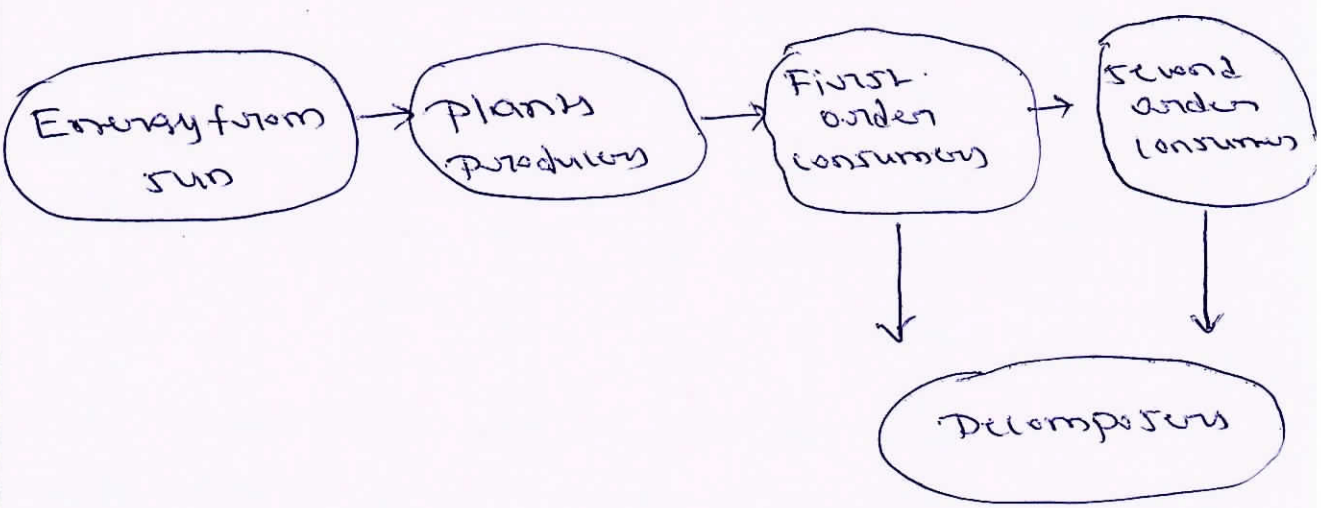
The energy in the ecosystem can be depicted within the form of a food pyramid or energy pyramid. The food pyramid has a large base of vegetation known as producers

The pyramid has a narrower middle section that depicts the number & biomass of herbivorous animals, which might be called first order ~~producers~~ consumers.

The apex depicts the small biomass of carnivorous animals called second order consumers.

When plant life & animals die, this material is back to the soil after being damaged down into simpler substance by means of decomposes inclusive of bugs, worms, bacteria & fungi so that plant life can take in the vitamins via their roots.

Animals excrete waste products after digesting food which goes back to the soil. this links the energy cycle to the nitrogen cycle.



6(b) Ecological succession

Ecological succession is a process through which ecosystems tend to transform over a period of time.

Succession can be related to seasonal environmental changes, which create adjustments in the community of plant life & animals residing in the surrounding

There is a tendency for succession to produce a more or less stable state at the end of the successional stages. the successive levels are associated with the manner where in strength flows via the organic system.

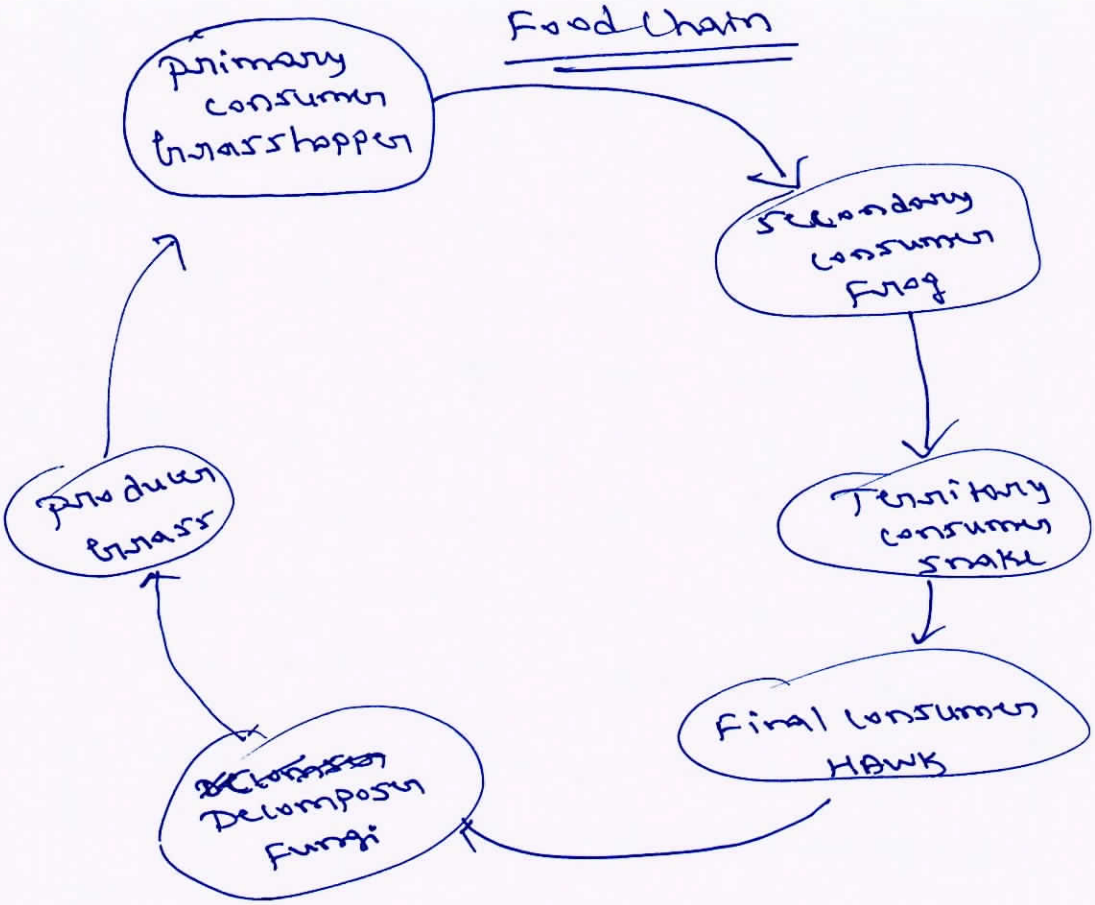
Food chains, Food webs & ecological pyramid.

The transfer of energy from the source in plants through a series of organisms by eating & being eaten constitutes food chains there foods chains are not isolated sequences, but are interconnected with each other.

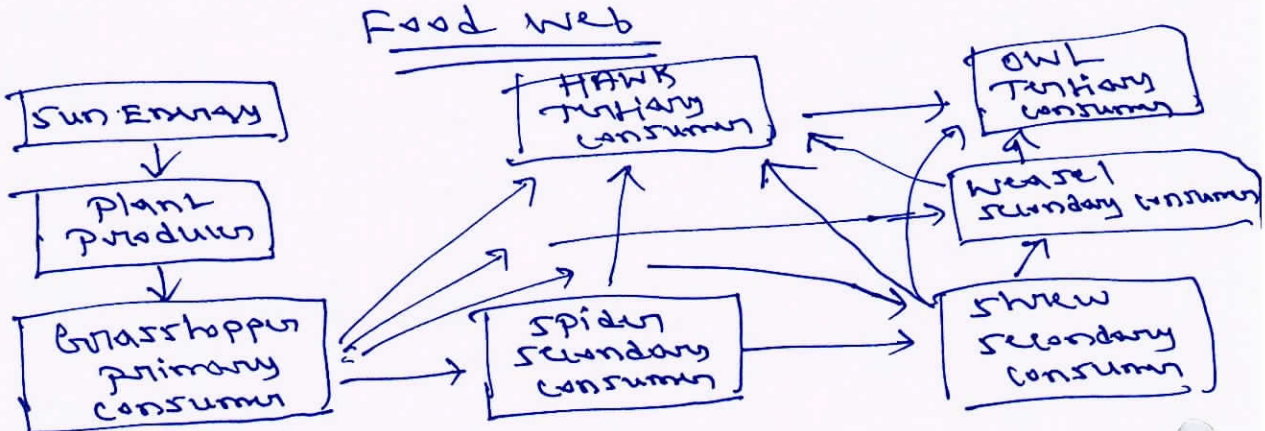
this interlocking pattern is known as the food web.

Each step of the food web is called a ~~de~~ trophic level. these tropic levels together form the ecological pyramid.

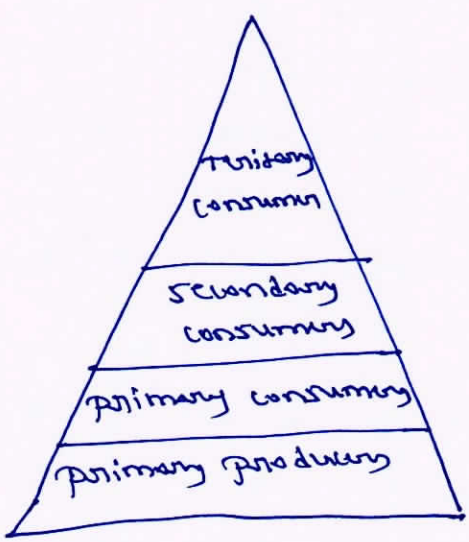
Food Chain



Food web



Energy pyramid or food pyramid



6(b)

Ecosystem

Forest ecosystem

Forest are formed by a community of plants which is predominantly structurally defind by its trees, shrubs, climbers & ground cover.

The forest ecosystem has two parts:

* The non living or abiotic aspects of the forest: The type of forest depends upon the abiotic conditions at the site vegetation is specific to the amount of rainfall & the local temp which varies according to latitude & altitude.

* The living or the biotic aspects of the forest: The plants & animals from communities that are specific to each forest type. The biotic components includes both the large (malrophyter) & the microscopic plants & animals

Types of forest ecosystem

* coniferous forest
* Broadleaved forest
* Evergreen forest
* Deliduous forest
* Thorn forest
* mangrove forest

* Altitude
* Rainfall
* Its climatic condition
* Wind speed
* Intensity of solar radiation
* Type of soil

Grassland Ecosystem

A wide range of landscapes in which the vegetation is mainly formed by grasses & small annual plants form a variety of grassland ecosystems with their specific plants & animals.

Grassland cover areas where rainfall is usually low & / or the soil depth & quality is poor.

The low rainfall prevents the growth of a large number of trees & shrubs, but is sufficient to support the growth of grass cover during the monsoon.

Each grassland ecosystem has a wide variety of species of grasses & herbs.

Types of Grasslands

* The Himalayan pasture & belt
* The Terai
* The semi - arid plains
* The Shola grasslands

Desert ecosystem

Deserts & semi-arid areas are located in western India & the Deccan plateau. The climate in these vast tracts is extremely dry.

This has sand dunes. There are also areas covered with sparse grasses & a few shrubs, which grow if it rains.

The rainfall is scanty & sporadic. In an area it may rain only once even few years. Desert & semi arid regions have a number of highly specialized insects & reptiles.

Aquatic Ecosystem

The aquatic ecosystems constitute the marine environments of the seas & the fresh water systems in lakes, rivers, ponds & wetlands.

These ecosystems provide human beings with a wealth of natural resources.

The aquatic ecosystems are classified into freshwater, brackish & marine ecosystems, which are based on the salinity levels.

The 3 types of Aquatic ecosystem

* The fresh water ecosystems
* marine ecosystem
* Brackish water ecosystem

- Environmental pollution

7(a) Environmental pollution can be defined as any undesirable change in physical, chemical, or biological characteristics of any component of the environment i.e air, water, soil which can cause harmful effects on various forms of life or property.

Pollution:- The term pollution can be defined as influence of any substance causing nuisance, harmful effects, & uneasiness to the organisms.

Pollutant:- Any substance causing nuisance or harmful effects or uneasiness to the organisms, then that particular substance may be called as the pollutant

Types of pollution

* Air pollution
* Water pollution
* Soil pollution
* marine pollution
* Noise pollution
* Thermal pollution
* Nuclear hazards

Air Pollution

Air pollution occurs due to the presence of undesirable solid or gaseous particles in the air in quantity that are harmful to human health & the environment.

Air may get polluted by natural causes such as volcanoes, which release ash, dust, sulphur & other gases

Sources or cause of Air pollution

Pollutants that are emitted directly from identifiable sources are produced both by natural events [for example, dust storms & volcanic eruptions] & human activity [emission from vehicles, industries etc] These are called primary pollutants

There are five primary pollutants that together contribute to a large extent to air pollution.

There are carbon oxides (CO & CO_2), nitrogen oxides, sulphur oxides, volatile organic compounds [mostly hydrocarbons] & suspended particulate matter.

Pollutants that are produced in the atmosphere when certain chemical reactions take place among the primary pollutants are called secondary pollutants. these are sulfuric acid, nitric acid, carbonic acid

Types of Air pollutants

* carbon monoxide
* sulphur oxides
* Nitrogen oxides
* Hydrocarbons
* particulates
* Lead.

Effects of Air Pollution

* Reduced lung functioning
* Irritation of eyes, nose, mouth & throat
* Asthma attacks
* Respiratory symptoms such as coughing & wheezing.
* Increased respiratory disease such as bronchitis
* Headaches & dizziness
* Cardiovascular problems
* Premature death.

Control measures

* Proper fuel & exhaust system in vehicles
* Use of dry & wet collectors, filters, electrostatic precipitators
* Providing greater height to the stalks Discharge pollutants away from the ground.
* Using unleaded fuels
* Using fuels with low sulphur & ash content
* Plant trees along busy streets as they remove particulates, carbon dioxide & absorb noise
* Catalytic converters should be used to help control emissions of carbon monoxide & hydrocarbons.

7(a) Water pollution

Water pollution can be defined as alteratio
in physical, chemical or biological characteristi
-s of water through natural or human
activities & making it unsuitable for its
designated use.

Water pollutants

Water pollutants also include both organic
& inorganic factors.
organic factors include volatile organic
compounds, fuels, waste from tyres, plants
etc.
Inorganic factors include ammonia, chemic
waste from factories, discarded cosmetics w

Causes of water pollution

* Industrial waste
* Sewage & waste water
* mining activities
* marine dumping
* chemical fertilizers & pesticides
* Leakage from sewer lines

Effects of water pollution

* sewage, fertilizer & agricultural run
-off contain organic materials that when
discharged into waters, increase the
growth of algae, which causes the
depletion of oxygen

* Groundwater contamination from pesticides causes reproductive damage within wildlife in ecosystem

* Industrial chemicals & agricultural pesticides that end up in aquatic environments can accumulate in fish that are later eaten by humans. Fish are easily poisoned with metals that are also later consumed by humans.

Control measures

* Sewage treatment: The household water should be treated properly so that they become environmentally safe.
* prevent river water to get polluted
* Treatment of wastes before discharge.
* Treatment of drainage water.
* Keep the pond water clean & safe.

8 (a)

Soil pollution

Soil is dynamic natural body composed of mineral matter & organic matter & living forms in which plant grows.

The undesirable change in physical, chemical & biological characteristics of soil, which are harmful for all living beings

Causes of soil pollution

* Agricultural pesticides
* Disposal of solid wastes on land
* mining activity
* Biological agents
* Radioactive pollutants
* Heavy metal pollutants

Effects of soil pollution

* Soil fertility is adversely affected if pesticide remain in soil for longer period.
* Excessive use of fertilizers & pesticide chemicals does not allow microbial flora & fauna in soil to flourish
* Excessive use of nitrogen & phosphate fertilizer makes the soil deficient in other micronutrients like Zn, Co etc & causes nutrition imbalance.
* Heavy metals & other toxic substances can destroy beneficial microorganisms of the soil

Control Soil Pollution

* Reduling chemical fertilizer & pestiside use.
* Recycling is another way to reduce & control soil pollution.
* Reusing of materials
* planting trees on re-forestation
* Designated pit should be used for the dumping of soil wastes.

Marine pollution

The introduction of substanly or energy by the man to the marine environment resulting in harmful effects such as Hazards to human health & marine activity

Causes of marine pollution

* maritime transporation
* sewage
* Solid waste
* Industrial wastewater & chemicals
* Oil spill
* Air pollutants

Effects of marine pollution

* effects on sea life
* Effects on birds
* effects on human being
* Health
* Business

Control measures

* Spills – Detection & clean up
* emergency contingency plan
* Oil spill clean up equipment
* ~~Ind~~ Industrial wastewater treatment
* Domestic sewage
* Urban runoff

Noise pollution

Sound becomes undesirable when it disturbs the normal activities such as working, sleeping, & during conversations.

It is an underrated environmental problem because of the fact that we can't see, smell or taste it.

causes of noise pollution

* construction equipments
* Aircrafts
* Industrial noise
* Railway stations
* Traffic

effects of noise pollution

* Heart problems
* Hearing problems
* sleeplessness
* mental Health problems
* Lack of concentration
* High Blood pressure

control measures of noise pollution

* Tree plantation
* Soundproof Homes
* Loudspeaker prohibition
* Factory isolation
* machine quality.

Thermal Pollution

Thermal pollution is the act of altering the temp of a natural water body, which may be a river, lake or ocean environment

The discharge of warm water into a river is usually called a thermal pollution

Causes of thermal pollution

The major sources of thermal pollution are discharge of heated water or hot waste material into water bodies from

* Nuclear power plant
* Industrial effluents
* Domestic sewage
* Hydro-electric power
* Coal fired power plants
* Thermal shock.

Effects of thermal pollution

* The warm water holds relatively less oxygen than cold water
* A sudden thermal shock can result in mass killings of fish, insects, plants, or amphibians
* Due to decrease in dissolved oxygen levels there is suffocation of plants & animals species which create anaerobic condition.

Control measures of thermal pollution

* cogeneration, a process where waste heat is recycled for domestic & or industrial heating purposes
* cooling towers, which transfer waste heat to the atmosphere through evaporation & or heat transfer

Nuclear hazards

Risk or danger to human health or the environment posed by radiation ~~emand~~ emitting from the atomic nuclei of a given substance, or the possibility of an uncontrolled explosion originating from a fusion or fission reaction of atomic nuclei

causes of nuclear hazards

* A nuclear disaster all starts with a nuclear plant, & a thing called nuclear reaction.
* It is impossible for any nuclear ~~reaction~~ reaction to explode like an atomic bomb.

effects of nuclear hazards

* Radiation effects can be somatic or genetic
* somatic effects the function of cells & organs.
* Genetic affects the future generation.
* people suffer from blood cancer & bone cancer if exposed to doses around 100 to 1000 roentgens.

Control measures of nuclear hazards

* Nuclear power plants should be located in areas after careful study of the geology of the area
* laboratory generated nuclear wastes should be disposed off safely & scientifically.
* Safety measures against accidental release of radioactive elements must be ensured in nuclear plants.

7(b) Solid waste management

Waste, which is non-effective & comes from city, town or village as domestic & biomedical waste is termed as solid waste.

The process of transportation, storage collection & processing of solid waste in a protective & economic manner is termed as solid waste management (SWM)

Nature of the problem

* SWM is a civic problem & it has to evolve optimally & continuously to serve the future generation
* Solid wastes if unchecked can not only be a health hazard but will impart multidimensional threat.
* Everyone is involved in solid waste generation problem so everyone should be involved in the proper disposal of it

SWM Techniques

An integrated waste management strategy includes three main components

* Source reduction
* Recycling
* Disposal

Source Reduction :- is one of the fundamental ways to reduce waste.

This can be done by using less material when making a product, reuse of products on site, designing products or packaging to reduce their quantity.

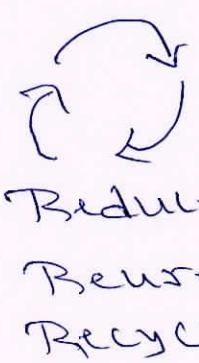
Recycling :- is reusing some components of the waste that may have some economic value.

Recycling has readily visible benefits such as conservation of resources reduction in energy used during manufacture & reducing pollution levels.

Disposal :- of solid waste is done most commonly through a ~~Satis~~ sanitary landfill or through incineration. A modern sanitary landfill is a depression in an impermeable soil layer that is lined with an impermeable membrane.

↙ A soil through which water has difficulty flowing

↘ one through which no substance can pass.



Disaster management

Disaster management refers to effective management of counter measures that are taken in order to mitigate the effect natural calamities that lead to desperate situations after calamities such as earthquakes, floods, landslides, tsunamis etc.

Disaster management pivots around preplanning, which includes

* organizing general disaster management teams to respond to any general disaster & in any terrain
* organizing special quick response teams that are highly specific to nature & region of disaster.

8(b) ## Role of individual in prevention of pollution

* Develop respect for all forms of life
* plant trees wherever you can & more importantly take care of them. They reduce air pollution
* Reduce the use of fossil fuels by either walking up a short distance using a car pool, sharing a bike or using public transport. This reduces air pollution

* Don't use aerosol spray products & commercial room air fresheners They damage the ozone layer
* Recycle all newspaper, glass, aluminium & other items accepted for recycling in your area.
* Use ~~rechargeable~~ rechargeable batteries.
* Shut off the lights & fans when not needed.

- Social issues & the Environment

10(a) Climate Change

The avg temp in several regions has been increasing in recent decades. The worldwide avg surface temp has increased by 0.8°C to 0.6°C over the last century.

many nations have experienced increases in rainfall, especially within the international locations located inside the mid to high latitudes.

It weather is changing making it extra hard for mankind to survive

The earth is losing its ability to balance itself owing to the imbalance created by human activity.

Studies conducted by Intergovernmental panel on global climate change (IPCC) have shown that within the close to future the worldwide mean surface temp can rise by 1.4°C to 5.8°C.

Global warming

About 71% of the sun power achieving the earth is absorbed on the earth surface which increases its temp. Whatever is left of the warmth transmits back to the atmosphere. Some of the heat is trapped through greenhouse gases, often by carbon dioxide.

As greenhouse emission is discharged by numerous human activity, it quickly increasing causing global warming.

Human activities for the duration of the last few decades of industrialization & population boom have polluted the atmosphere & affecting the weather.

Acid rain

When fossil fuels consisting of coal, oil & natural gas are burnt, chemical substances like sulfer dioxide & nitrogen oxides are produced

These chemicals react with water & different chemicals substances in the air to form sulfuric acid, nitric acid, & other harmful pollutions like sulfates & nitrates.

These acid pollutants unfold upwards into the atmosphere & are carried via air currents, to eventually return to the ground in the form of acid rain, fog or snow.

The corrosive nature of acid rain produces many forms of environmental damage.

9(a) Ozone layer Depletion

Ozone is made by the action of daylight on O_2. It forms a layer 20 to 50 kms over the surface of the earth.

This action takes place naturally within the atmosphere, however is extremely slow.

Ozone gas is extremly toxic with a powerful odour. It is a type of oxygen that has three particles in every atom. It is taken into consideration as a pollutant at ground level & constitutes a health risk by inflicting respiratory ailments like allergies & bronchitis.

The ozone layer within the upper atmosphere absorbs the sun ultraviolet radiation preventing it from reaching the earth surface.

Nuclear Accidents

Nuclear energy become researched & discovered via man as a source of alternative power which would be easy & cheap in comparison to fossil fuel. A single nuclear accident can motive loss of life, long time period infection & destruction of belongings on a big scale for a long time frame.

Nuclear Holocaust

The use of nuclear energy in war has had devastating effects on man & earth. The best use of nuclear strength in conflict in history, Hiroshima & nagasaki incident in the course of world war II, is one ~~one~~ of the worst disasters.

10 (b) Wasteland Reclamation

loss of vegetation cover leads to loss of soil through erosion, which ultimately creates wasthlands. loss of soil has already ruined a massive amount of cultivable land in our country. Unless we competently shield our cultivable lands, we might also sooner or later face a extreme scarcity of meals grain, vegetables, fruit, fodder & fuel timber.

Hence conservation of soil, defensive the present cultivable land & reclaiming the already depleted wasteland figures prominently of making plans for the future.

Wasteland can be classified into three forms

* Easily reclaimable
* ~~Easily~~ ~~Reclai~~ Reclaimable with some difficulty
* Reclaimable with extreme difficulty.

Environment Protection Act

passed in march 1986. It came into force on 19 November 1986. It has 26 sections.

The purpose of the act is improvement of the human environment & the prevention of hazards to human beings, other living creatures, plants & property.

The Air (Prevention & Control of Pollution) Act

The Government passed this Act in 1981 to clean up our air by controlling pollution.

* To provide for the prevention, control & abatement of air pollution
* to provide for the establishment of central & state Boards with a view to implement the Act.
* To confer on the Boards the power to implement the provision of the act & assign to the boards function relating to pollution.

9(6) Water (Prevention & control of pollution) Act

The Government has formulated this Act in 1974 to be able to prevent pollution of water by industrial, agricultural & household wastewater that can contaminate our water sources.

* The Act also aims at restoration of wholesomeness of water
* The water Act is designed to assess pollution levels & punish polluters
* The central government & state government have set-up pollution control boards to monitor water pollution
* The water Act of 1974 along with amendments in 1978 is an extensive legislation with more than sixty sections for prevention & control of water pollution.

(B-S-Patil)

3/22

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