Energy and Environment Sceince
L-T-P-C: 2-0-0-2

Syllabus:

Unit – 1 [4 Hours]: Present Energy resources in India and its sustainability:

Energy Demand Scenario in India, Different type of **conventional Power Plant**, Advantage and Disadvantage of conventional Power Plants, **Conventional vs Non- conventional power generation**.

Unit – 2 [4 Hours]: Basics of Solar Energy: Solar Thermal Energy; Solar Photovoltaic: Advantages and Disadvantages, Environmental impacts and safety.

Unit – 3 [4 Hours]: Wind Energy: Power and energy from wind turbines, India's wind energy potential, **Types of wind turbines, Offshore Wind energy**, Environmental benefits and impacts.

Unit – 4 [4 Hours]: Biomass Resources: Biomass conversion Technologies, Feedstock pre-processing and treatment methods, Bioenergy program in India, Environmental benefits and impacts; **Other energy sources**: **Geothermal Energy resources, Ocean Thermal Energy Conversion, Tidal Energy.**

Unit – 5 [4 Hours]: Air pollution: Sources, effects, control, air quality standards,

air pollution act, air pollution measurement; **Water Pollution**: Sources and impacts; **Soil Pollution**: Sources and impacts, disposal of solid waste. **Noise pollution**

Unit – 6 [4 Hours]: **Greenhouse gases effect**, acid rain; Pollution aspects of various power plants; **Fossil fuels and impacts, Industrial and transport emissions impacts.**

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Unit – 1 [4 Hours]:
Present Energy resources in India and its sustainability:

Energy Demand Scenario in India,
Different type of conventional Power Plant,
Advantage and Disadvantage of conventional Power Plants,
Conventional vs Non- conventional power generation

CLASSIFICATION OF ENERGY SOURCES

1. Based on Usability of Energy

a) **Primary resources -** These include resources embodied in nature prior toundergoing any human-made conversions or transformations. This only involves extraction or capture. Examples of primary energy resources are coal, crude oil, sunlight, wind, running rivers, vegetation and radioactive material like uranium

b) **Secondary Resources** -energy resources supplied directly to consumer for utilization after one or more steps of transformation are known as secondary or usable energy, e.g. electrical energy, thermal energy (in the form of steam or hot water), refined fuels or synthetic fuels such as hydrogen fuels, etc.

CLASSIFICATION OF ENERGY SOURCES

2. Based on Traditional Use

a) **Conventional -** Energy resources, which are being traditionally used, for many decades and were in common use around oil crisis of 1973, are called conventional energy resources, e.g. fossil fuels, nuclear and hydro resources.

b) **Non-conventional** - Energy resources, which are considered for large-scale use after the oil crisis of 1973, are called non-conventional energy sources, e.g. solar, wind, biomass, etc.

CLASSIFICATION OF ENERGY SOURCES

3. Based on Long-Term Availability

a) Non-renewable - Resources, which are finite and do not get replenished after their consumption, are called non-renewable

e.g. fossil fuels, uranium, etc. They are likely to deplete with time.

b) Renewable - Renewable energy is energy obtained from sources that are essentially inexhaustible. The most important feature of renewable energy is that it can be harnessed without the release of harmful pollutants.

Examples of renewable resources include wind power, solar power, geothermal energy, tidal power and hydroelectric power.

CLASSIFICATION OF ENERGY SOURCES

4. Based on Commercial Application

a) **Commercial Energy Resource -** The energy sources that are available in the market for a definite price are known as commercial energy. By far the most important forms of commercial energy are electricity, coal and refined petroleum products.

b) **Non-commercial Energy** - The energy sources that are not available in the commercial market for a price are classified as non-commercial energy. Non-commercial energy sources include fuels such as firewood, cattle dung and agricultural wastes, which are traditionally gathered, and not bought at a price, used especially in rural households.

CLASSIFICATION OF ENERGY SOURCES

5. Based on origin

(a) Fossil fuels energy
(b) Nuclear energy
(c) Hydro energy
(d) Solar energy
(e) Wind energy
(f) Biomass energy
(g) Geothermal energy
(h) Tidal energy
(i) Ocean thermal energy
(j) Ocean wave energy

COMMON FORMS OF ENERGY

1. **Electrical Energy -** About 30–40 per cent energy distribution in the world is met through electrical supply system at present. It can be very conveniently and efficiently converted to other forms of energy.
2. **Mechanical Energy -** Mechanical energy is required for movement of objects, changing the shape of the objects, etc. It is used in transportation, agriculture, handling, processing, and other industrial processes.
3. **Chemical Energy -** Fuels and organic matter contain chemical energy. Exothermic chemical reactions release heat energy. Also chemical energy is directly converted into electrical energy in fuel cells, storage batteries, etc. and into thermal energy by combustion.

4. Thermal Energy -Thermal energy is considered to be of lower grade as compared to electrical and mechanical energy. It is used to raise the temperature of an object during industrial processes. It can also be converted to mechanical energy with the help of heat engines. There are three grades of thermal energy depending on the temperature at which it available:

1. **High grade (500–1000 °C and higher):** It can be converted efficiently into mechanical energy.
2. **Medium grade (150–500 °C):** It can be converted into mechanical energy with difficulty and with lower efficiency.
3. **Low grade (80-50 °C):** It cannot be ordinarily converted into mechanical energy and used mostly for the purpose of heating only.

Advantages and Disadvantages of Conventional & Non- Conventional sources

Advantages and Disadvantages of conventional sources

Energy Sources

- Fossil fuels, nuclear and hydro resources are considered as conventional sources. There use has following advantages and disadvantages.

- **Advantages**

1. Cost : At present these are cheaper than non-conventional sources.

2. Security : As storage is easy and convenient, by storing certain quantity, the energy availability can be ensured for certain period.

3. **Convenience:** These sources are very convenient to use as technology for their conversion and use is universally available.

Disadvantages

1. Fossil fuels generate pollutants. Main pollutants are **CO, CO2, NOx, SOx, particulate matter and heat**. These pollutants degrade the environment, pose health hazards and cause various other problems. CO2 is mainly responsible for global warming also.

2. There are **safety and technical issues with nuclear energy**. Major problems associated with nuclear energy are

(a) The waste material generated in nuclear plants **has radioactivity of dangerous le**vel. Its safe disposal, which is essential to prevent radioactive pollution, is a **challenging task**.

(b) Disposed radioactive waste is required **to be guarded for a long period** (till its radioactivity level comes down to a safe limit)

(b) Possibility of **accidental leakage of radioactive material** from reactor (as happened in Chernobyl, former USSR in April 1986)

(c) Uranium resource has **limited availability.**

(d) **Sophisticated technology is required** for using nuclear resources.

Advantages and Disadvantages of Non-conventional sources

Merits

1. Non-conventional sources are available in nature free of cost.
2. They produce no or very little pollution. Thus by and large they are environment friendly.
3. They are inexhaustible.
4. They have low gestation period.

Demerits

1. In general the energy is available in dilute form from these sources.

2. Though available freely in nature the cost of harnessing energy from nonconventionalsources is generally high.

3. Uncertainty of availability: the energy flow depends on various natural phenomena beyond human control.

4 Difficulty in transporting this form of energy.

5. Difficulty in storage.

Energy, economy and social development

Environmental Aspects of Energy

Trade-off between Energy and Environment

Environment literally means surroundings.

Air, soil and water are the main constituents of environment.

Nature has originally provided them to human beings in clean form.

However, with the passage of time, their quality is continuously being degraded due to various manmade reasons.

Chief **among them are a number of activities involving**

- **energy generation and its utilization**. During any energy conversion process some energy is expelled by the energy conversion system into surroundings in the **form of heat**. Also some **pollutant**s may be produced as a by-product of this process. Both of these cause certain degradation of environment.
- Therefore, while supplying the **increased energy demand**, efforts should be made to adopt measures to minimize the degradation of environment.
- The present trend is to have a **trade-off between the two**. Future seems to be in favour of **developing renewable and environment friendly energy resources**.

Ecology

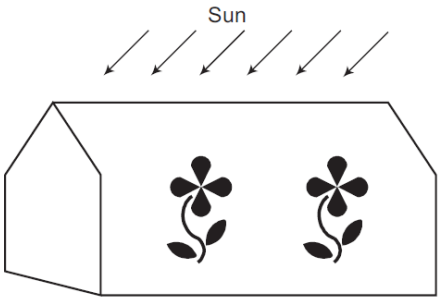
Ecology deals with the **relationship existing between living organisms** (man, animals, plants and vegetation) and the **environment.**

Normally, nature has self-cleaning capability and recycles (renews) its resources through various processes thus maintaining a state of equilibrium.

Water cycle, nitrogen cycle and carbon cycle are the well-known examples of this. However, when human interference exceeds the limits, the **ecological balance is disturbed.**

Greenhouse Effect

- A green house is an enclosure having transparent glass panes or sheets It behaves differently for incoming visible (short wave) radiation and outgoing infrared (long wave) radiation.
- It appears as transparent for incoming solar radiation, allowing entry of sunlight and becomes largely opaque for reflected infrared radiation from earth surface, preventing exit of heat. Thus it maintains a controlled warmer environment inside for growth of plants, in places where the climate is very cold.
- Carbon dioxide (CO_2) enveloppe présent around the globe in the atmosphere behaves similar to a glass pane and forms a big global green house. This tends to prevent the escape of heat from earth, which leads to global warming. This phenomenon is known as greenhouse effect.



Energy, economy and social development

- Energy is universally recognized as one of the most important input for economic growth and human development.
- Access to modern energy services is fundamental to fulfilling basic social needs, driving economic growth and fueling human development.
- Energy services have an **effect on productivity, health, education, safe and potable water and communication services.**
- **Modern services such** as electricity, natural gas, modern cooking fuel and mechanical power are necessary for improved health and education, better access to information and industrial as well as agricultural productivity.
- Thus, secure, reliable, affordable, clean and equitable energy supply is fundamental to global economic growth and human development.
- One of the major challenges facing the world at present is that approximately **1.3 billion people live without any access to modern energy services.**
- **Access to energy is a fundamental pre-requisite for modern life** and a key tool in **eradicating extreme poverty across the globe.**
- Broadly, there are four major energy end use sectors:
  1. **Industrial**
  2. **Commercial**
  3. **Residential**
  4. **Transportation**

Example: A poor rural family of five persons consumes 1 kg per person per day of firewood for cooking needs and 2 kg of kerosene oil per month for lighting. Calculate the annual primary energy consumption per person in KGOE. Assume heating value of wood as 4000 kcal per kg and that of kerosene oil as 45 MJ per kg.

Solution

- Annual firewood consumption of the family for cooking = 5 × 1 kg × 365
- = 1825 kg
- Annual primary energy required for cooking = 1824 × 4000 kcal
- = 73,00,000 kcal
  = 730 KGOE (refer Appendix A)
- Annual kerosene requirement of the family for lighting = 12 × 2 kg = 24 kg
- Annual primary energy required for lighting = 24 × 45 = 1080 MJ
  = 1080 × 23.884 × 10–3 KGOE
  = 25.795 KGOE (refer Appendix A)
- Total annual primary energy consumption of the family = 730 + 25.795
- = 755.8 KGOE
- Total annual primary energy consumption per person = 755.8 / 5
  = 151.2 KGOE

IMPORTANCE OF NON-CONVENTIONAL ENERGY SOURCES

- The concern for environment due to ever-increasing use of fossil fuels and rapid depletion of these resources has led to development of alternative sources of energy, which are renewable and environment friendly. Following points may be mentioned in this connection:

  1. Conventional sources (except hydro) are non-renewable and finite assets. With present rate of consumption their availability is rapidly declining.

  2. The demand of energy is increasing exponentially due to rapid industrialization and population growth, the conventional sources of energy alone will not be sufficient in the long run, to meet the growing demand.

  3. Conventional sources (fossil fuels, nuclear) also cause pollution leading to degradation of the environment. Ultimately, their use has to be restricted within acceptable limits.

  4. Large hydro resources affect wild life, cause deforestation and pose various social problems.

  5. In addition to supplying energy, fossil fuels are also used extensively as feedstock for the manufacture of organic chemicals. As reserves deplete, the need for using fossil fuels exclusively for such purposes may become greater

- **Due to these reasons it has become important to explore and develop nonconventional energy resources to reduce too much dependence on conventional resources**. However, the present trend of developments of non-conventional sources indicate that these will serve as supplement rather than substitute for conventional sources for some more time to come.

ENERGY-ENVIRONMENT-ECONOMY

- Thus the "**three Es" - environment, energy, and economic development are closely interrelated in a complex manner**. The strategy for mitigating "three Es" issues is a strategy for environmentally sustainable economic development. Herman Daly, a famous ecological economist laid down **three conditions for sustainability**:
  1. **The consumption rate of renewable resources is not higher than its recovery rate.**
  2. **The consumption rate of non-renewable resources is not higher than the rate of increase in renewable resource supply.**
  3. **The emission of pollutants is within the absorption capacity of the environment.**

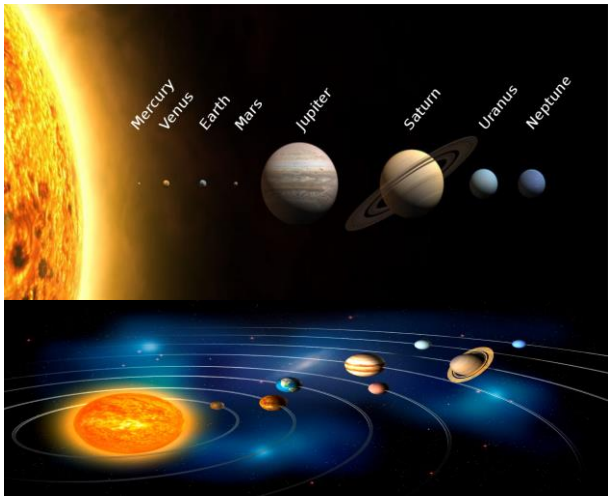
- Unfortunately these conditions have been violated for years. Examples of respective violations typically include deforestation, the depletion of fossil fuels, and the increase in CO_2 concentration in the air. Such violations may be hard to reverse in the short term but, unless long-term remedial actions are taken, present global development trends will not be sustainable.
- In particular, a substantial reduction in resource consumption and emissions of pollutants is essential for the development of a sustainable human society on this planet.
- As evident from the above discussions, the Economy, Environment and Energy are closely interrelated and an overall policy is required to deal with them.

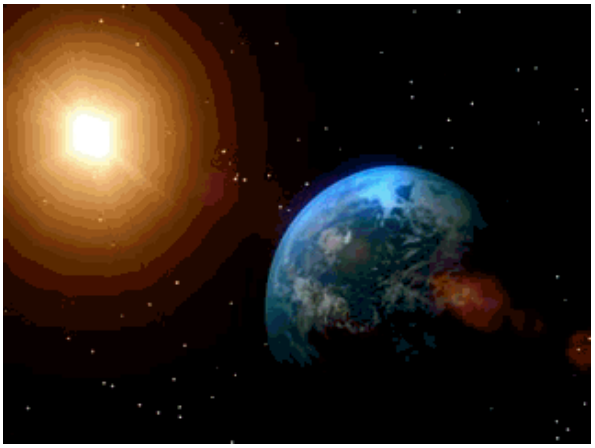
SAVING THE EARTH AND ENERGY RESOURCES

1. Earth and life in the Biosphere
2. Natural recourses
3. Carbon cycle and Energy resources
4. Energy ,Environment and Climatic change
5. Energy Audit and Conservation
6. Summery and Conclusion

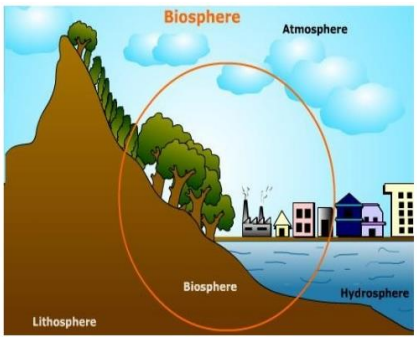
1. Earth and life in the Biosphere

Earth is the only place in the known universe confirmed to host life

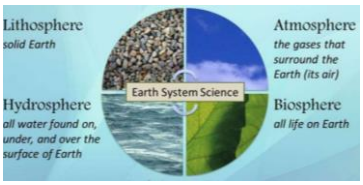


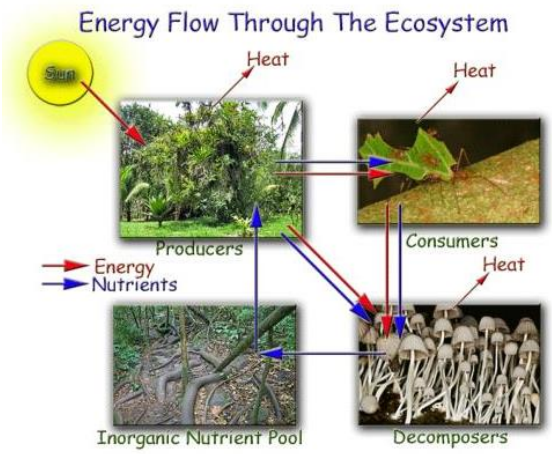


Biosphere



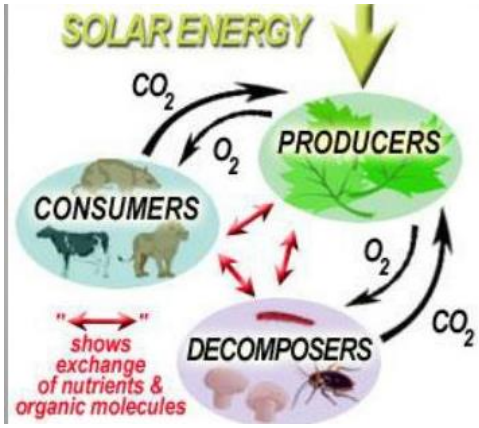
It is the entire interconnected ecosystem of earth Air,land,surface water where life occurs





The biosphere is the portion of the earth that supports living things. It includes living and non-living things.

Energy Flow from Sun



Energy Flow cont…

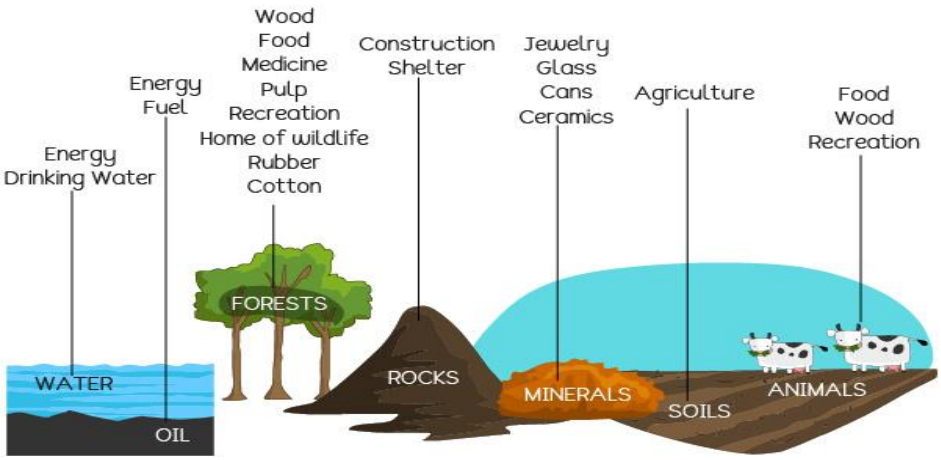
- Producers: Produce food other organisms use
- Consumers: Consume plants and other organisms for food
- Decomposers: Break down and use dead plants and animals for food



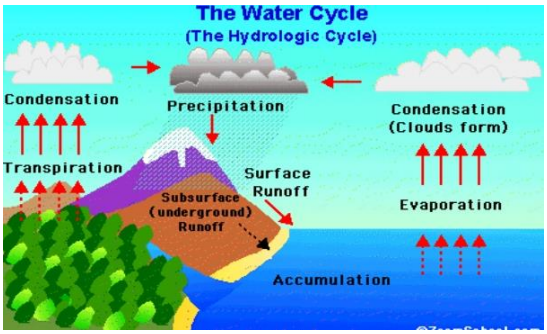
Energy flows from environment through producers to consumers and finally to decomposers

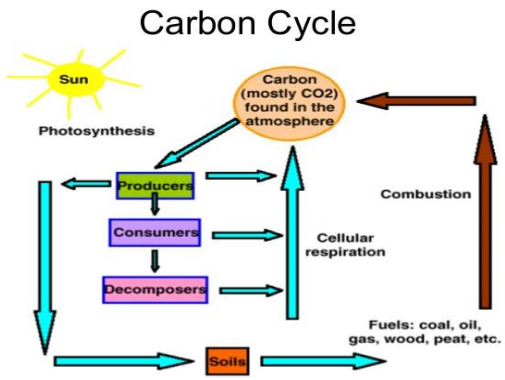
2. Natural Resources

What are the Natural Resources?

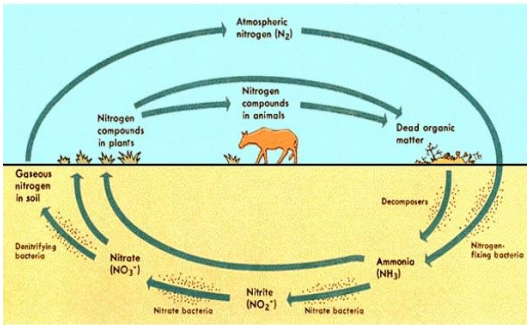


Resources may be **solids, liquids, or gasses**. They may also be **organic or inorganic**. They may also be metallic or non-metallic. They may be **renewable or non-renewable**

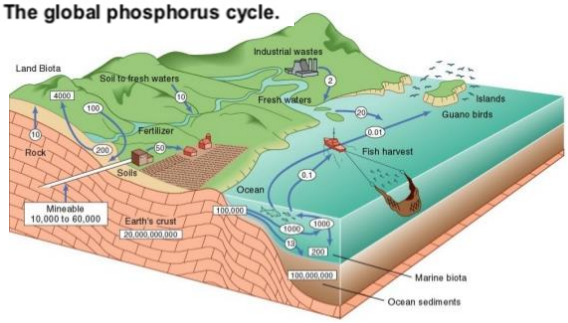




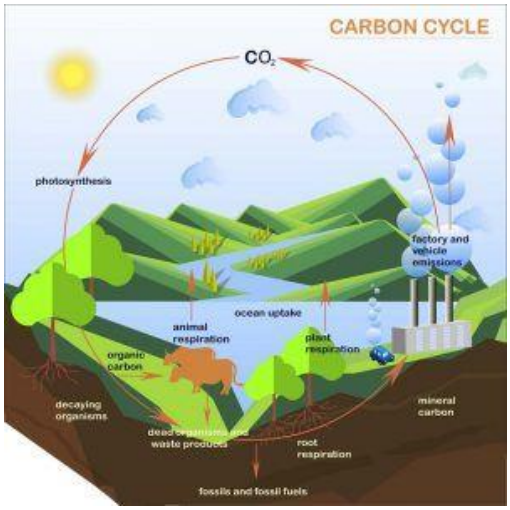
Nitrogen Cycle



The global phosphorus cycle.

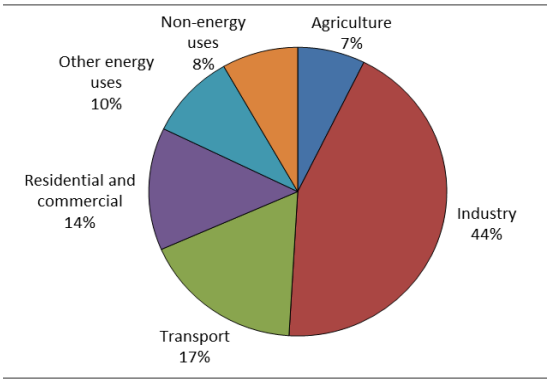


Why is the Carbon Cycle Important?

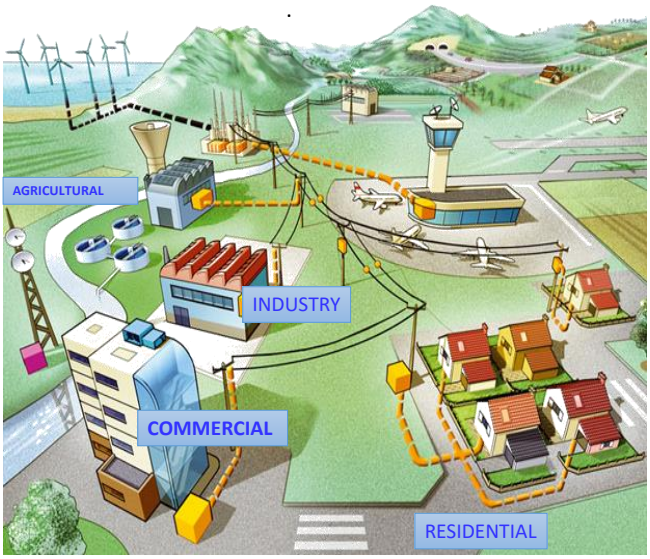


- The carbon cycle, under normal circumstances, works to ensure the stability of variables such as
  - ✓**Earth's atmosphere,**
  - ✓**the acidity of the ocean, and**
  - ✓**the availability of carbon for use by living things**.
- Each of its components is of crucial importance to the health of all living things – especially humans, who **rely on many food crops** and animals to feed our large population.

Sectors that use energy



The industrial sector consumes almost 44 % of the total commercial energy consumption followed by transport.



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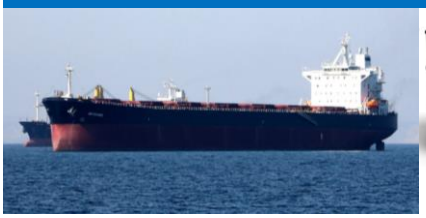
Fossil Fuel Energy Scenario in India



- India has 0.3% of world Oil
- 4.8% of world oil consumption.
- **Imported- 82% of oil**
- Huge import bill

- Coal is the major share of Energy Mix, 56 %
- **Importing 30% of coal consumption**
- 76% of electricity generated from coal
- Avg power plant efficiency: 28-32% Most efficient- 45%

- India has 0.6% of world N.Gas
- **Importing 40% of N.Gas**
- ✓ City Gas distribution-Auto taxi,Bus
- ✓ Piped Natural gas- Industry,commercial,domestic

If the exchange rate shifts by a rupee to a dollar, OR a dollar per barrel, India's oil import bill reduce by Rs 3000 crore

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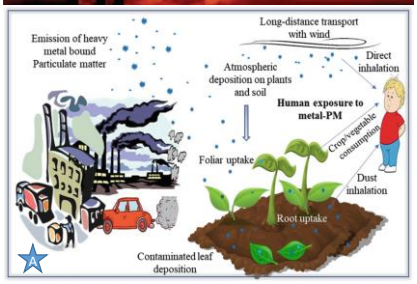
Installed Power Generating Capacity of India

	MW	% of Total
Total Thermal	2,31,456	62.2%
Coal	1,99,595	53.7%
Lignite	6,360	1.7 %
Gas	24,992	6.7%
Diesel	510	0.1%
Hydro (Renewable)	45,699	12.3%
Nuclear	6,780	1.8%
RES* (MNRE)	88,042	23.7%
Total	371,977	

* Installed capacity in respect of RES (MNRE) as on 31.07.2020.
RES (Renewable Energy Sources) include Small Hydro Project, Biomass Gasifier, Biomass Power, Urban & Industrial Waste Power, Solar and Wind Energy.

4. Energy ,Environment and Climatic change



- The principal emissions causing impact on the air environment are <u>particulate matter (dust), Sulphur oxides, nitrogen oxides, and carbon monoxide</u>.

1. **Particulate matter - G**enerated from the combustion of solid fuels like coal, lignite, biomass etc. (***ash content*** **)**
2. **Sulphur oxide (SOx)** emissions mainly occur from combustion of oil and coal due to ***sulphur content*** .
3. **Nitrogen oxides (NOx)** emissions are also **associated with fuel combustion and air**
4. **SOx and NOx** emissions **lead to acid rain** which is a trans-boundary environmental issue
5. **Carbon dioxide** is a **major contributor to global warming** and climatic change though **it is not consider as pollutants**.

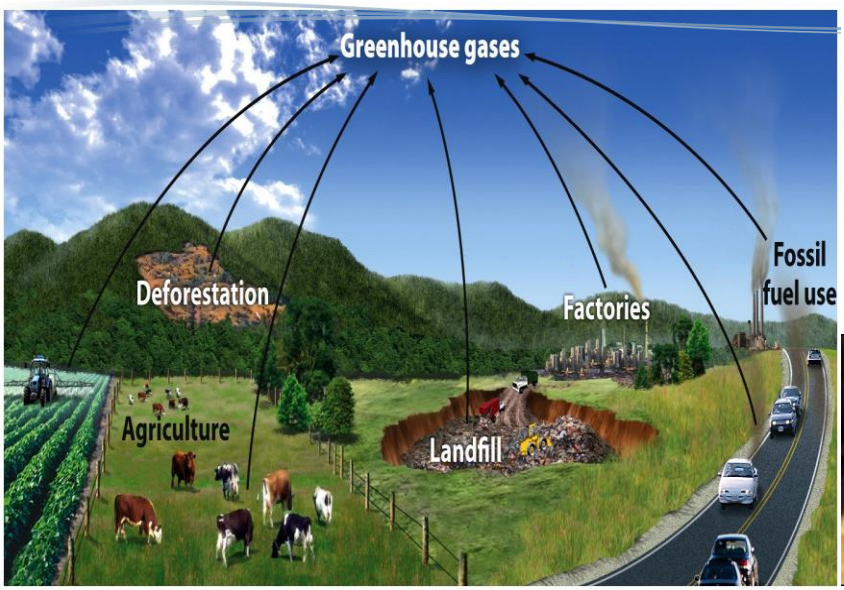
Global Greenhouse Gas Emissions

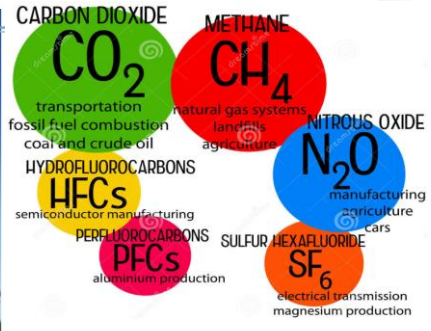
- Since the Industrial Revolution, annual CO2 emissions from fuel combustion dramatically increased
- Agriculture activity producing small shares of CH4 and N2O from domestic livestock and rice cultivation,
- CO2 from fossil fuels & cement contributes almost 70% of global GHG emissions

India's Greenhouse Gas Emissions

- India contributed to almost 7% of global emissions
- India is world's fourth largest contributor in terms of CO_2 emissions (5%) behind China (22%), USA(20%) and Russia. Major source - coal, petroleum, N.gas

Green House Gas – Major Causes

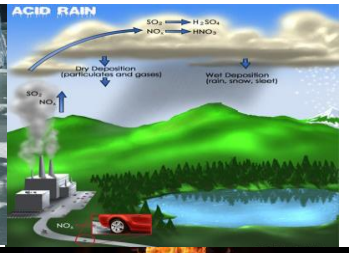


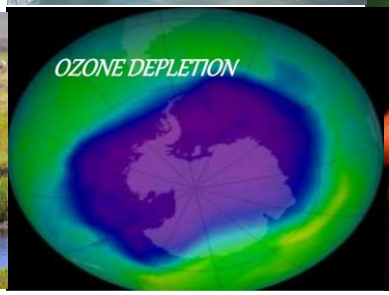


Global Environmental Issues

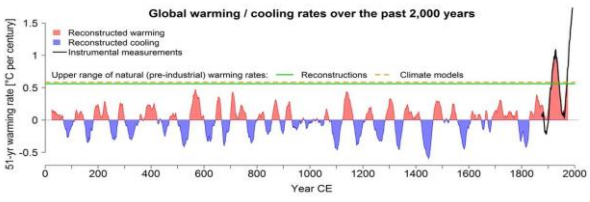
Some of the key environmental issues of global significance are

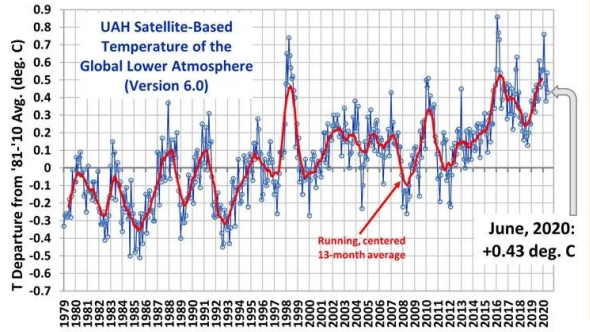
- ❑ Acid rain
- ❑ Ozone layer depletion
- ❑ Global warming and climatic change
- ❑ Loss of biodiversity





U.N. climate summit-Paris Agreement

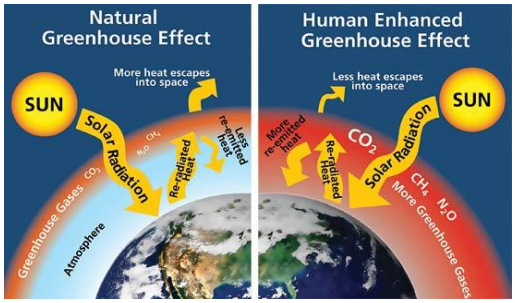




- The average global temperature in 2020 is set to be about 1.2 °C above the pre-industrial (1850-1900) level.
- Paris agreement 2015 — countries mostly stuck to a set of voluntary promises
- It would lead to global warming of 2.7 degrees
- A lot has changed over the last five years

- **There is a need for immediate GHG Emission cuts**
- EU leaders agreed on a new target of slashing net greenhouse gas emissions by 55 percent by 2030.
- China -the biggest polluter on the planet would reach net carbon neutrality in less than 40 years.

Unwelcome threshold -1.5 ^{O}C



- 1.5 degree threshold represents a milestone the world is trying not to reach:
- 2015 Paris Agreement on climate change, backed by almost every country on earth, calls for keeping the global temperature to 1.5°C above pre-industrial era levels.
- Countries must decrease production of fossil fuels by 6 per cent per year between 2020 and 2030 if the world is to avert "**catastrophic" global temperature rise,**
- UN Secretary-General said the **fight against the climate crisis** was the top priority for the 21st Century.

Energy Management ,Energy Audit and Conservation

The strategy of adjusting and optimizing energy, using systems and procedures so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems

- **Eliminate waste:** Ensure that energy is used at the highest possible efficiency.
- **Maximize efficiency:** Utilise the most appropriate technology
- **Optimize supply:** Purchase or supply energy at the lowest cost.

Energy management is the process of monitoring, controlling, and **conserving energy** in an Industry or organization.

What is an Energy Audit ?

- *As per the Energy Conservation Act, 2001, Energy Audit is defined as* "the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption "

- ✓ 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, and serves to identify all the energy streams in a facility.
- ✓ It quantifies energy usage according to its discrete functions

In your Organization, Industry, Office Building Commercial building , or Home

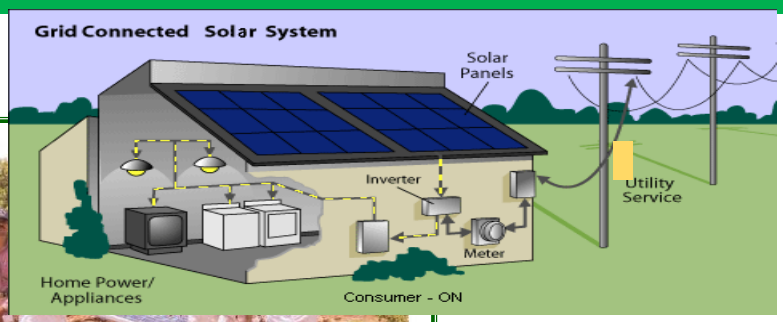
- What type of energy used?
- How much energy is used?
- How much does it cost?
- Where Electricity / fuels are used?
- How efficiently it is used?
- How can it be managed more efficiently and effectively?

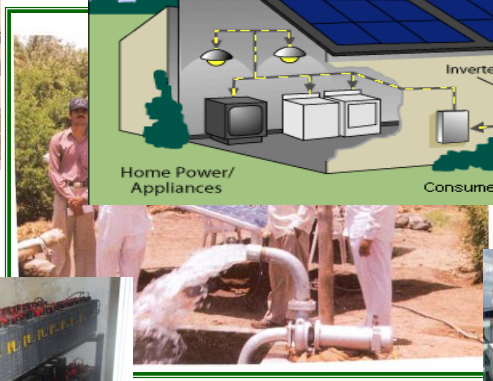
Where do we start to find the answer?

This is identified through carrying out

ENERGY AUDITs

Strat your own Renewable Energy Products/Services

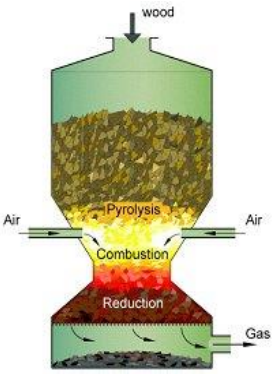




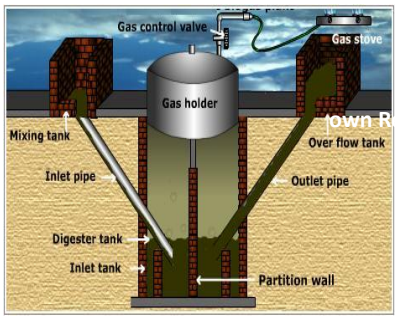
Strat your own Bio- Energy Products/Services

BRIQUETTEDBIOMASS

GREEN COAL



PRODUCER GAS



BIO GAS PLANT

Save energy, Save environment and Save the earth

There's a direct connection between your energy use and the environment.

When you consume less power, you reduce the amount of toxic fumes released by power plants, conserve the earth's natural resources and protect ecosystems from destruction.

By taking steps to reduce your energy intake, you'll contribute to a healthier and happier world.

- Everyone can do their bit to prevent this depletion.
- We must reduce our dependence on fossil fuels which are soon running out.
- Don't waste water ,don't pollute water and use efficiently and make clean water and safe.
- Don't cut down forests, but plant more trees.

Company Services

EnSave Consultancy and Training Pvt. Ltd

- Established under Companies Act, (2015)

Areas of Services

1. Energy Audit (Electrical &Thermal)
2. PAT Mandatory Audit / M&V Audit
3. ISO 50001-2018 EnMS Implementation
4. Building Audit , Green Buildings LEED/IGBC/GRIHA
5. Energy Manager certification training
6. Interactive Project Development training & Panel Discussion
7. Entrepreneurship in solar / bio-energy projects
8. IOT/BMS/EMS/Electronics integration
9. Energy efficient products /ESCO
10. Water Audit, Electrical Safety audit

Industries

- Thermal power plants,
- Steel, foundry,
- Cement, Paper, sugar, refinery,
- Chemical, fertilizer,
- Textile, pharmaceutical
- Dairy
- Railways
- Hotels, IT sector, Hospital , retail shops, banks, Educational institute and Residential building

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www.ensaveindia.in
https://ecourse.ensaveindia.in

Training Services

In-house/ Corporate Training

LIST OF ENERGY MANAGEMENT COURSE MODULES

A-Electrical Utility

Module-1: ELECTRICAL DISTRIBUTION SYSTEM- TRANSFORMERS, PF, MD, CAPACITORS, LOSS REDUCTION
Module-2: ENERGY EFFICIENCY IN ELECTRIC MOTOR
Module-3: VFDs, HARMONICS & POWER QUALITY MANAGEMENT
Module-4: LIGHTING SYSTEM AND CONTROLS
Module-5: DG SET OPERATION AND MAINTENANCE

B-Mechanical Utility

Module-6: ENERGY EFFICIENCY IN PUMP AND PUMPING SYSTEM
Module-7: ENERGY EFFICIENCY IN FAN SYSTEM
Module-8: ENERGY EFFICIENCY IN COMPRESSED AIR SYSTEM
Module-9: ENERGY EFFICIENCY IN REFRIGERATION SYSTEM
Module-10:ENERGY EFFICIENCY IN AIR CONDITIONING SYSTEM
Module-11:ENERGY EFFICIENCY IN COOLING TOWER

C-Thermal Utility

Module-12: FUELS AND COMBUSTION (Oil &Gas)
Module-13: EFFICIENT OPERATION AND MAINTENANCE OF BOILER
Module-14: EFFICIENT USE OF STEAM AND STEAM TRAP
Module-15: BOILER & COOLING WATER TREATMENT
Module-16: HEAT EXCHANGERS & TRI-GENERATION

D-Energy Audit, Management and General Aspects

Module-17: CLIMATIC CHANGE AND NEED FOR ENERGY EFFICIENCY
Module-18: ENERGY AUDITING AND MANAGEMENT
Module-19: ISO-50001 EnMS CERTIFICATION
Module-20: GREEN BUILDINGS INITIATIVES, ECBC/LEED
Module-21: WATER AUDIT AND CONSERVATION
Module-22: WATER TREATMENT/ETP

E-Renewable Energy

Module-23: SOLAR THERMAL TECHNOLOGY & APPLICATION
Module-24: SOLAR POWER GENERATION TECHNOLOGY & APPLICATION
Module-25: BIO ENERGY TECHNOLOGY & APPLICATION

ENSAVE CONSULTANCY AND TRAINING PVT LTD

Online Training & e-learning Courses

Testimonials

Concept and procedure were explained with actual onsite experiences help a lot
Dr Chandira Sekeran

Possible mistakes that one can make while solving problems was highlighted nicely with example
Omkar Avinash

Problem solving, Doubt clearance, To the point, According to exam pattern and especially pointing from where there is possibility of questions to come, Condensed ppt
Anurag Amrit

Easy understanding and stress on important topics
P Rajesh

We have inherited this planet from our fathers … ……only to look after it for our children

Thank You

Q & A

EnSave Consultancy & Training Pvt Ltd
Dr.P.Dharmalingam
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Save energy and water for Sustainable Life