MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)

Rasipuram - 637 408, Namakkal Dist., Tamil Nadu

Estd. 2000

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L 01

LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental science and Engineering / 19BSS12**

Course Teacher : **Dr.S.Anand**

Unit : **I -Ecosystem and Biodiversity** **Date of Lecture:**

Topic of Lecture: Definition, scope and importance of environment

Introduction :

The word environment is derived from the French word "Environ" meaning "surroundings". Each and everything around us is called as Environment.

Every organisms is surrounded by materials and forces which constitute its environment, from which it must derive its needs. Environment creates favourable conditions for the existence and development of living organisms.

Prerequisite knowledge for Complete understanding and learning of Topic:

The student should expected to have primary knowledge about Environment

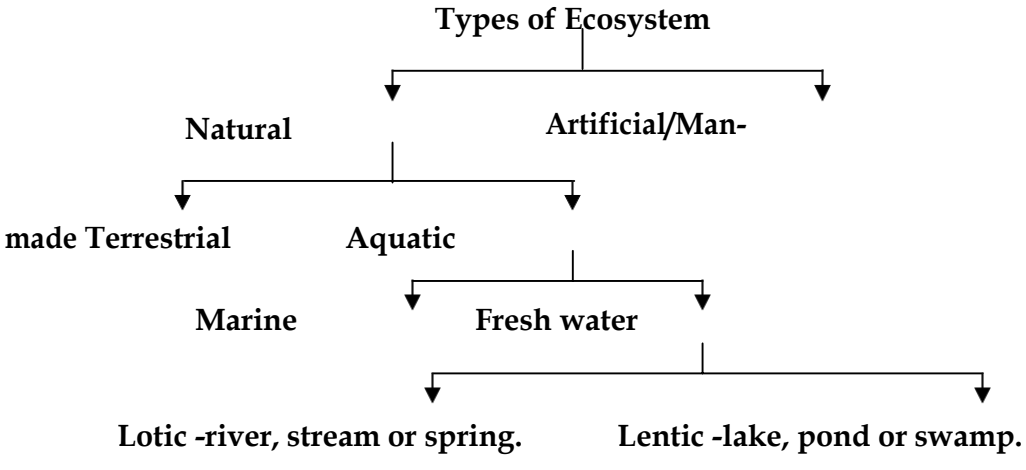
- Ecosystem
- Artificial Ecosystem
- Natural Ecosystem
- Terrestrial Ecosystem
- Aquatic Ecosystem

Detailed content of the Lecture:

Environment

Environment is defined as "the sum of total all living and non living things around us influencing one another"

Ecosystem -living things in a given area, non-living chemical and physical factors of their environment, linked together through nutrient cycle and energy flow



1) ***Terrestrial ecosystem*** related to land vegetation – *grassland ecosystem, forest ecosystem, desert ecosystem , etc.,*

2) ***Aquatic ecosystem*** related to water and is further sub classified into 2 types based on their salt content as,

- **Fresh water ecosystem**

a) *Running water ecosystem* – rivers, streams.

b) *Standing water ecosystem* – pond, lake.

- **Marine ecosystem –** sea and sea shore.

Scope of Environmental Studies

1. To get awareness and sensitivity to the total environment and its related problems

2. To motivate the active participation in environmental protection and improvement

3. To know the necessity of conservation of natural sources.

4. To develop the skills for identifying and solving environmental problems.

5. To evaluate the environmental programmes interms of social, economic, and aesthetic factors.

Environment Studies: Importance

1. Environment Issues are being of Global:
2. Development and Environment:
3. Explosive Increase in Pollution Need for an Alternative Solution
4. Need for Wise Planning of Development

Video Content / Details of website for further learning (if any)
https://www.youtube.com/watch?v=KAuf-oBNvOU

Important Books/Journals for further learning including the page nos.: -
Reference Book: Dr.A.Ravikrishnan page nos 2.4 to 2.9

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L 02

LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **I-Ecosystem and Biodiversity** **Date of Lecture:**

Topic of Lecture: Concept Of an Ecosystem, Structure & its Functions

Introduction :

The word environment is derived from the French word "Environ" meaning "surroundings". Each and everything around us is called as Environment.

Every organisms is surrounded by materials and forces which constitute its environment, from which it must derive its needs. Environment creates favourable conditions for the existence and development of living organisms.

Prerequisite knowledge for Complete understanding and learning of Topic:

The student should expected to have primary knowledge about Environment

- **Ecosystem**
- **Biotic Components**
- **Abiotic Components**

Detailed content of the Lecture:

Environment

Environment is defined as "the sum of total all living and non living things around us influencing one another"

Ecosystem -living things in a given area, non-living chemical and physical factors of their environment, linked together through nutrient cycle and energy flow

STRUCTURE (OR) COMPONENTS OF AN ECOSYSTEM

- **Abiotic (non-living) components.**
- **Biotic (living) components.**

ABIOTIC COMPONENTS

- The non living components of ecosystem

  Examples – Climate, soil, water, air, energy, nutrients *etc.*,
- ***Physical components*** include the energy, climate, raw materials and the living space which the biotic components (living organisms) needs.

  Examples – air, water, soil, sunlight, *etc.*,

- ***Chemical components*** are the sources of essential nutrients.

  Examples :

- *Organic substances* – Protein, lipids, carbohydrates, *etc.,*
- *Inorganic substances* – All micro (Al, Co, Zn, Cu) and
- macro elements (C, H, O, P, N, K)

BIOTIC COMPONENTS

The living components are made of many different species which are distinguished based on their feeding habit. It includes,

Autotrophic components include ***producers*** which are autotrops & they derive energy from sunlight to make organic compounds. ***Examples-*** Green plants, algae, bacteria, *etc.,*

Heterotrophic components include ***consumers*** and ***decomposers*** which are heterotrophs i.e. they depend on others especially the producers for food.

he heterotrophs are

- *Macro consumers* – herbivores, carnivores, omnivores.
- *Saprotrophs (micro consumers)* – decomposers (bacteria, fungi, etc.,)

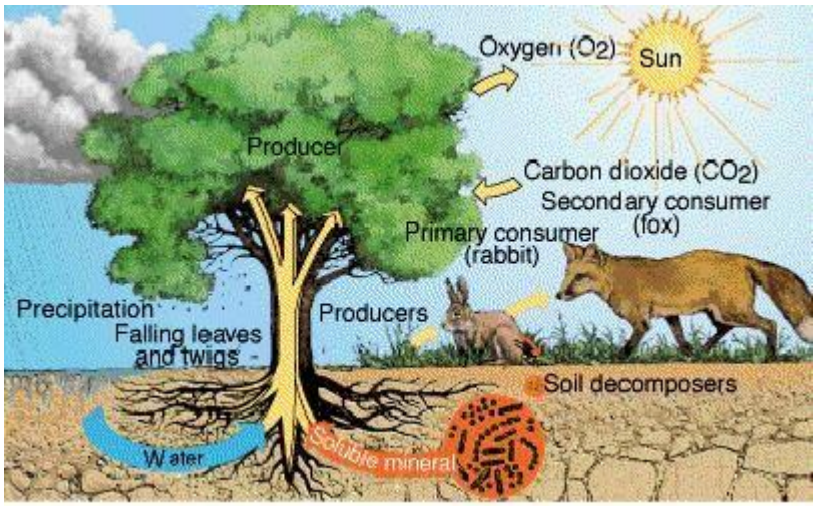
Ecology - Study of the distribution and abundance of organisms, the flows of energy and materials between abiotic and biotic components of ecosystems.

Ecosystem Structure: The living components of an ecosystem

- The roles of organisms in an ecosystem:
- Producer (autotrophy): make food; plants, algae
- Consumer (heterotrophy): eat other organisms
- Decomposer: eat dead organic matter; bacteria and fungi

Classes of Consumers

- Herbivore – primary consumer – eats plants
- Carnivores – secondary – meat eaters; eat
- Omnivores – eat plants/animals.



Role of Organisms

Scavengers – feed on dead organisms (vultures, flies, crows, lobsters)

Detritus feeders – organisms that extract nutrients from fragments of dead organisms into more simple organic waste (termites, earthworms, crabs)

Decomposers – organisms that digest parts of the dead organisms into simplest chemicals (bacteria, fungi)

Functions of an ecosystem is of 3 types :

- ***Primary function*** of all ecosystem is manufacture of starch (photosynthesis) .
- ***Secondary function*** is distributing energy in the form of food to all consumers.
- ***Tertiary function*** includes decomposing the dead items and initiate the process of "cycling"

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L 03

LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental Science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **I-Ecosystem and Biodiversity** **Date of Lecture:**

Topic of Lecture: Energy Flow in Ecosystem and Ecological Succession

Introduction :

- All organisms must obtain a supply of energy and nutrients from their environment in order to survive.
- Ecological succession is defined as, "A change in the community in which new populations of organisms gradually replace existing ones".

Prerequisite knowledge for Complete understanding and learning of Topic:

- Solar Energy
- Photosynthesis
- Producers
- Consumers
- Community

Detailed content of the Lecture:

ENERGY FLOW IN ECOSYSTEM

- All organisms must obtain a supply of energy and nutrients from their environment in order to survive.
- The transformations of energy in an ecosystem begin first with the input of energy from the sun.
- Because, it is the first step in the production of energy for living things, it is called "Primary production".
- Photosynthesis -- Chemical reaction where green plants use water & carbon dioxide to store
  the sun's energy in glucose.
- Energy is stored in glucose.
- Glucose is stored as starch in plants
- The majority of autotrophs are photoautotrophs that harness the energy of the sun and pass some of this energy onto consumers through feeding pathways The energy contained within producers and consumers is ultimately passed to the decomposers that are responsible for the constant recycling of nutrients.
- Thus, there is a one-way flow of energy through the biotic community and a

cycling of nutrients between the biotic and abiotic components of the ecosystem

- Energy flow cannot occur in reverse direction.
- Starts from autotrophs (the producer level, i.e., first trophic level) to Heterotrophs including plant eaters or Herbivores (second trophic level) and so on.
- The amount of energy decreases with successive trophic levels.
- Only About 1% of energy from the sun is used by green plants & rest remains unutilized.
- Similarly, there is loss of energy in each trophic level.
- The transfer of food energy between the organisms in an ecosystem can be tracked by constructing food chains, food webs, pyramids of numbers, biomass and energy and energy flow diagrams.

First Law of Thermodynamics

Energy can neither be created nor destroyed, but it can be converted from one form to another

$$6Co2 + 12\ H2O \longrightarrow C6H12O6 + 6O2 + 6H2O$$

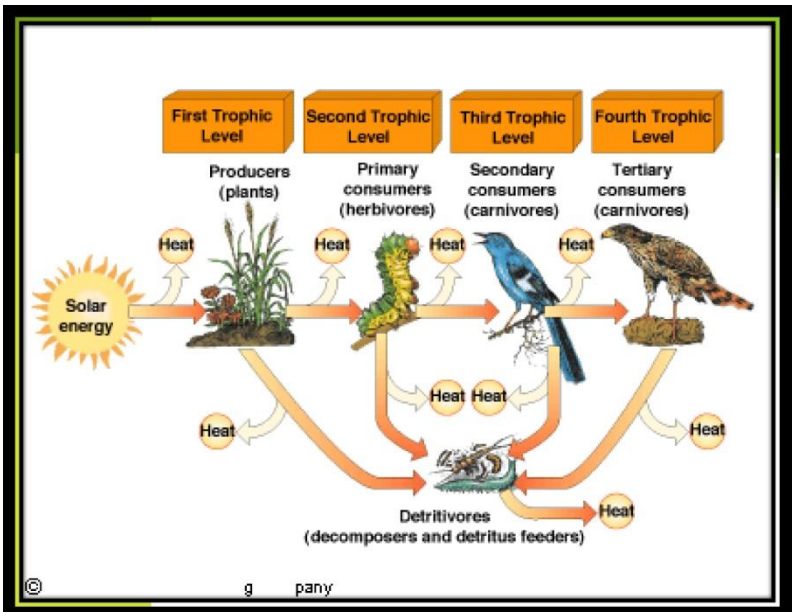
Solar energy is converted into **chemical energy** through photosynthesis by plants.

Second Law of Thermodynamics

- ***whenever energy is transformed, there is a loss of energy through the release of heat.***
- ***This occurs when energy is transferred between tropic levels.***
- ***The loss of energy takes place through respiration, running, hunting, etc.,***

Respiration equation

CH2O	+ O2	⟶	CO2	+	H2O
Carbohydrate	oxygen		carbondioxide		water



Ecological Succession

- Ecological succession is defined as, "A change in the community in which new populations of organisms gradually replace existing ones".
- There are two types of ecological succession:

1) Primary Succession

- Occurs where there is no soil, e.g. after a volcanic eruption or a glacial retreat.
- "Pioneer organisms"
- Simple plants first – no or shallow roots.
- Gradual influx of more complicated and larger plants as the habitat changes
- Unfavorable for life at first.
- Ends with a "climax community" – ecosystem stays constant, provided there are no changes in abiotic influences.

2) Secondary Succession

- Community development in the areas that were previously occupied by a other community.
- Occurs after a disturbance. E.g., loss of trees after disease, Fire or wind, deforestation etc.
- Conditions are favorable for as soil and nutrients are already present.
- More rapid than primary succession.

Process of Ecological Succession

- ***Nudation*** : development of bare area without any life form.
- ***Invasion*** : establishment of one or more species on a bare area through migration followed by establishment .
  - *Migration* : migration of seeds brought about by wind, water or birds.
  - *Establishment* : the seeds then germinate & grow on the land & establishes their pioneer communities.
- ***Competition*** : as the number of individual species grow there will be competition between them for space, water & nutrients
- ***Reaction*** : living organisms take water, nutrients & grow & modify the environment is known as reaction. This becomes unsuitable for some & favour for some species- leads to seral communities
- ***Stabilizations*** : it leads to stable community, which is in equilibrium

- with the environment

Primary Succession Vs Secondary Succession

Primary	Secondary
No soil.	Soil already exists
Weathering & decomposition	Seeds have suitable soil conditions
Humus and sand increase over time	Occurs much faster
End = Climax community	Climax community

Video Content / Details of website for further learning (if any)
https://www.youtube.com/watch?v=lnAKICtJIA4

Important Books/Journals for further learning including the page nos.: -
Reference Book: Dr.A.Ravikrishnan page nos 2.9 to 2.11

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L 04

LECTURE HANDOUTS

Chemistry

II/I

Course Name with Code : **Environmental Science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **I-Ecosystem and Biodiversity** **Date of Lecture:**

Topic of Lecture: Food chains, food webs & ecological pyramids

Introduction :

- A food chain may be defined as, "the transfer of energy and nutrients through a series of organisms with repeated process of eating and being eaten".
- Interlocking pattern of several interlinked food chains is termed as Food Web.
- An "Ecological pyramid" is a graphical representation that shows the relative amounts of energy or matter contained within each tropic level in a food chain or food web.

Prerequisite knowledge for Complete understanding and learning of Topic:

- Food Chain
- Food Web
- Phytoplankton
- Zooplankton
- Ecological Pyramids
- Pyramid of Numbers

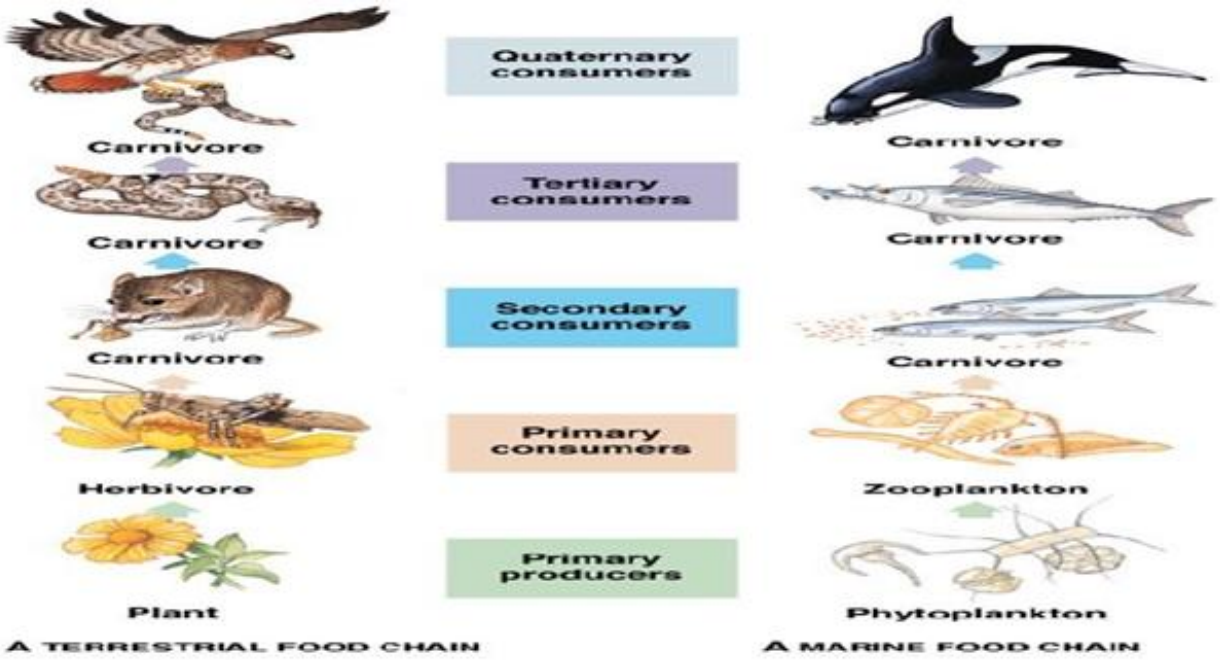
Detailed content of the Lecture:

Food Chain

- A food chain may be defined as, "the transfer of energy and nutrients through a series of organisms with repeated process of eating and being eaten".
- In an ecosystem, all the organisms are linked together with one another by food relationship.
- Each organism living or dead is potential food for some other organism.

Definition : The sequence of eating & being eaten in an ecosystem is food chain (or) Transfer of food energy from the plants through a series of organisms is food chain.

1. Food Chain in a Grass land: Plants → Rat → Snakes → Eagles
2. Food Chain in a Pond: Phytoplankton → Zooplankton → Small fist → large fish → Man
3. Food Chain in a forest: Plants →Deer→ Tigers/Lions



Grazing food chain

- Found in grassland ecosystems & forest ecosystems
- Starts with *green plants* & goes to decomposer food chain through herbivores & carnivores.

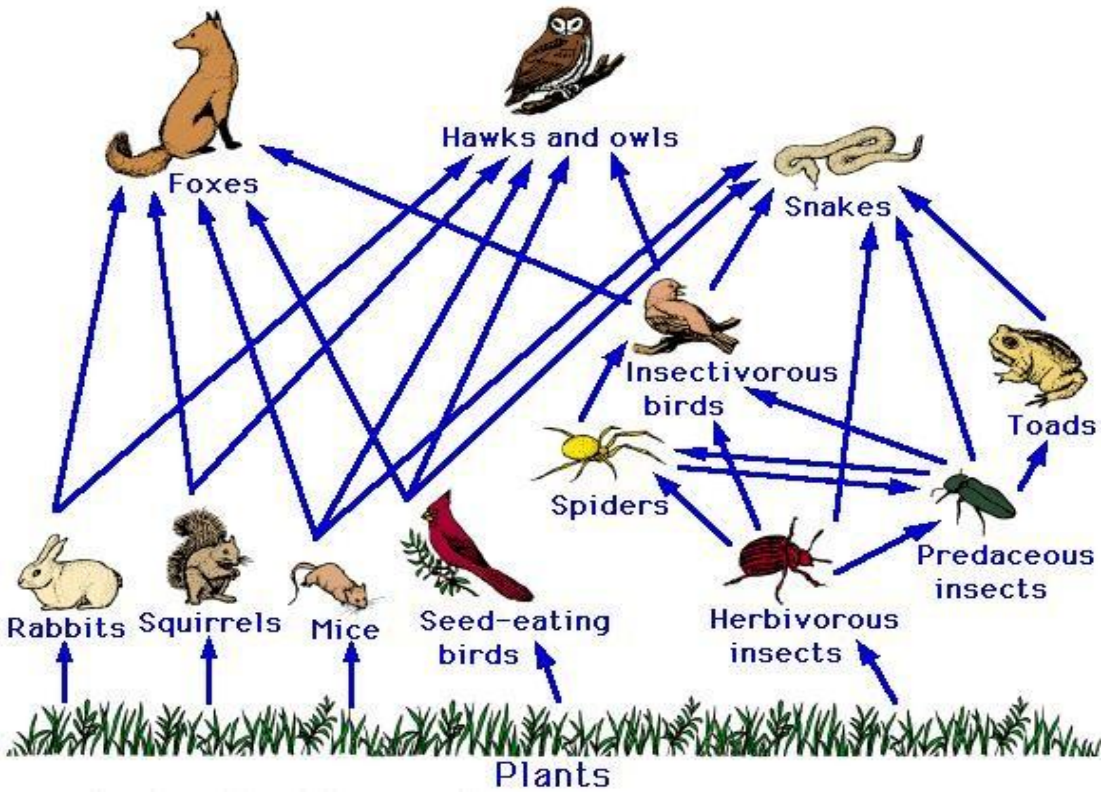
Detritus food chain

- Found in grassland ecosystems & forest ecosystems
- Starts with *dead organic matter* (plants & animals) & goes to decomposer food chain through herbivores & carnivores.

Food Web

- Under natural conditions, the linear arrangement of food chains hardly occurs & these remains connected interconnected with each other through different types of organisms.

- Interlocking pattern of several interlinked food chains is termed as FOOD WEB.



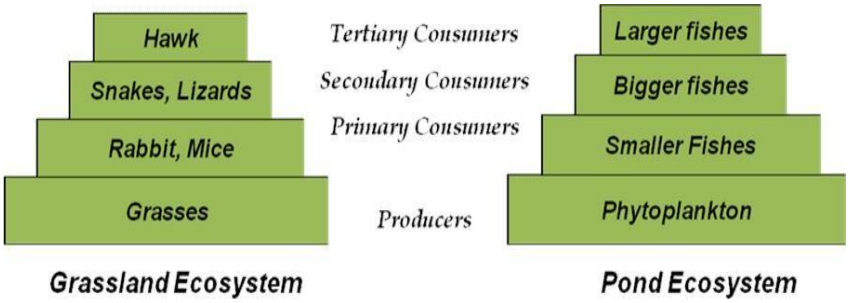
Significance of Food Chain and Food Web

- Both play an very important role in the ecosystem as because the *energy flow* & *nutrient cycling* takes place through them.
- They help in *maintaining the ecological balance* by maintain & regulating the population size of different tropic levels.
- They have the property of *biomagnification* .
- The non biodegradable materials keep on passing from one tropic level to another.
- At each successive tropic level, the concentration keep on increasing.
- This process is known as biomagnification.
- DDT sprayed for pest control is an example for biomagnification.

Ecological Pyramids

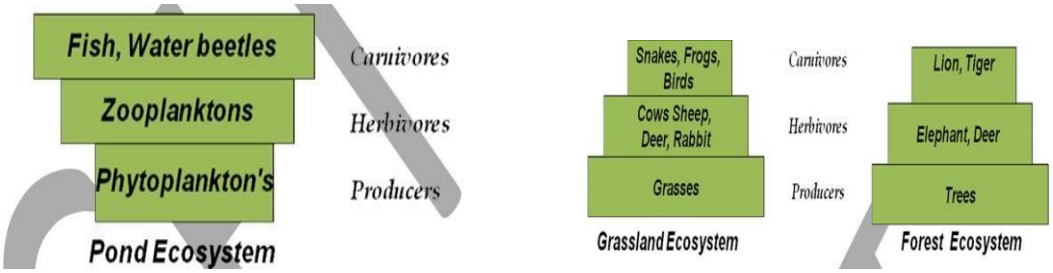
- An "Ecological pyramid" is a graphical representation that shows the relative amounts of energy or matter contained within each tropic level in a food chain or food web.
- An ecological pyramid shows the relationship between consumers and producers at different tropic levels in an ecosystem
- There are three ecological pyramids recognized by ecologists:

Pyramid of Numbers Shows the relative number of individual organisms at each tropic level.



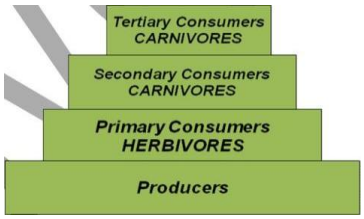
Pyramid of Biomass

❖ A pyramid of biomass represents the total dry mass (in grams per square meter of area) of all the organisms in each tropic level at a particular time.



Pyramid of Energy

❖ A pyramid of biomass represents the rate of energy flow and/or productivity at successive tropic levels. The pyramids of energy are always upright.



Video Content / Details of website for further learning (if any)
https://www.youtube.com/watch?v=hLq2datPo5M

Important Books/Journals for further learning including the page nos.: -
Reference Book: Dr.A.Ravikrishnan page nos 2.38

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L 05

LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental Science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **I Ecosystem and Biodiversity** **Date of Lecture:**

Topic of Lecture: Values of Biodiversity

Introduction :

The variety and variability among all groups of living organisms and the ecosystem in which they occur.

Prerequisite knowledge for Complete understanding and learning of Topic:

- Biodiversity
- Genetic diversity
- Species diversity
- Community Diversity

Detailed content of the Lecture:

Biodiversity

- Biodiversity is the variety and differences among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part.
- It is virtually synonymous with "Life on earth".
- Biologists most often define "biological diversity" or "biodiversity" as the "totality of genes, species, and ecosystems of a region".
- The biodiversity found on Earth today consists of many millions of distinct biological species, which is the product of nearly 3.5 billion years of evolution.

Levels of Biodiversity

1) Genetic diversity

- It is a level of biodiversity that refers to the total number of genetic characteristics in the genetic makeup of a species.
- It is distinguished from genetic variability, which describes the tendency of genetic characteristics to vary.

2) Species diversity

- ❖ It refers to the variety of species within a region.
- ❖ Species diversity is an index that incorporates the number of species in an area and also their relative abundance.
- ❖ It is generally a much more useful value than species richness.

3) Community and Ecosystem diversity

- ❖ Ecosystem diversity refers to the diversity of a place at the level of ecosystems. This has 3 perspective:
- ❖ Alpha Diversity: Within community diversity. Alpha diversity refers to the diversity of organisms sharing the same Community/Habitat.
- ❖ Beta Diversity: Between community diversity. It refers to the diversity of organisms sharing two habitats.
- ❖ Gamma Diversity: Diversity of the habitat over the total landscape or geographical area is called gamma diversity.

Values of Biodiversity

Food: About 80,000 edible plants and about 90% of present day food crops have been domesticated from wild.

Drugs & Medicines: About 75% of world's population depends on plants or plant extracts.

Fuel: Forests have been used since ages for fuel wood. Fossil fuels are also products of Biodiversity.

Social Value: Many of the plants like Tulsi, Lotus, Peepal etc are considered holy and sacred.

- ❖ About 2.1 million species have been identified till date, while many more species are believed to exist.
- ❖ According to UNEP estimate, approximately 9.0 – 52 million of species exist on Earth
- ❖ India's position is 10th in the world & 4th in Asia in terms of Plant diversity.

VALUES

1. Consumptive use:

Drugs: Many plants are used in primary health care.70% of modern medicines are derived from plant and plant extracts.

(Ex)Penicillin – fungus is the source – Antibiotic

Quinine – Chincona bark - Malaria treatment

Morphine – Poppy bark – Analgesic

Fuels: Fire woods are directly consumed by villagers.
Food: A large number of wild plants and wild animals are consumed by human beings as food.

2.**Productive use:**
Biodiversity products have commercial value.
These products are marketed and sold. These are derived from animals and plants

3.Social value:
*It refers to the manner in which the bio-resources are used in the society.
These are associated with the social life, religion and spiritual aspects of the people.
e.g., Holy plants: Tulsi, Lotus, Neem trees,
Holy animals: Cow, snake, bull, peacock

4.Ethical value:
It means that a species may or may not be used but its existence in nature gives us pleasure.
e.g., Holy river: River Ganga
Holy tree: Tulsi, Vengai

5.Aesthetic value:
The beautiful nature of plants and animals insists us to protect the biodiversity.
Ex) eco-tourism, colour of butterfly, flowers etc.

6.Optional value:
The optional value of biodiversity suggests that any species may be proved to be a valuable species after someday

Video Content / Details of website for further learning (if any)
https://www.youtube.com/watch?v=HqZVKioIUnc

Important Books/Journals for further learning including the page nos.: -
Reference Book: Dr.A.Ravikrishnan page nos 3.6 to 3.11

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L 06

LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental Science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **I-Ecosystem and Biodiversity** **Date of Lecture:**

Topic of Lecture: Hot- Spots Of Biodiversity and Threats To Biodiversity

Introduction :

Any disturbance in a natural ecosystem tends to reduce its biodiversity.

Prerequisite knowledge for Complete understanding and learning of Topic:

- Habitat loss
- Red data Book
- Poaching
- Endemic Species

Detailed content of the Lecture:

HOT- SPOTS OF BIODIVERSITY

The hot spots are the geographic areas which posses high endemic species.

An area is designated as a hot spot when it contains at least 0.5% of plant species as endemic.

Area of hot spot: There are 25 Hotspots of biodiversity on worldwide. Out of which 2 are present in India.

Eastern Himalayas → Nepal , Bhutan, Indo-Burma region,30% of endemic species

Western Ghats → Srilanka region, ex – Maharastra, Karnataka, tamilandu, kerela. 1500 endemic species .

Plants → Ternstroemia japonics, hypericum

Animals → Blue bird, lizard, hawk

THREATS TO BIODIVERSITY

Any disturbance in a natural ecosystem tends to

reduce its biodiversity. Various threats to biodiversity are:

1. **HABITAT LOSS:**

Loss of population of interbreeding organism.

Factors influencing Habitat Loss:

Deforestation:

Forest & grasslands are cleared for agricultural lands or developmental projects.

Many species disintegrate due to loss of natural habitat.

Destruction of wetlands:

Wetlands are destroyed due to pollution, draining etc.

Developmental activities:

Construction of dams in forest, industrial effluents kill birds & aquatic organisms.

Habitat fragmentation:

Habitat is divided into small & scattered So, many animal & birds are vanishing

Raw materials:

For the production of hybrid seeds, wild plants are used as raw materials.

Illegal Trade:

Trade on wild life reduces bio-diversity

2. POACHING:

Killing / Hunting of animals is poaching.

Types:

Subsistence Poaching- killing animals for surviving.

Commercial Poaching- hunting animals for selling

Factors influencing Poaching:

Human Population: increase in population increases pressure on forest resources.

Commercial activities: Smuggling of wild life products for high profit.

Wildlife products=Furs, horns, tusk, live specimen, herbal products.

Importers of wild life = Europe, North America, Japan, Taiwan, Hong Kong

Examples

- Male gorilla for its body parts
- Blue morpho butterfly – making attractive trays
- Snowy large egret – used for white feather in ladies hat.US
- Elephant feet – for making Ash trays
- Elephant – for ivory
- Bengal tiger – soled for $1,00,000 in foreign market
- Dynamite fishing – high tech fishing, exhaust marine life. Sea horses, Sea turtles

MAN-WILDLIFE CONFLICTS:

Examples:

Sambalpur – orissa:

195 humans were killed by elephants,

In retaliation- 98 elephants were killed, 30 injured by villagers.

Kote – Chamrajanagar –Mysore:

Sugarcane & cotton crop, explosives

Royal Chitwan National Park – Kathmandu

Man-eating tiger killed 16 nepalese, 4 yrs child

Sanjay Gandhi National Park – Mumbai

Leopards killed– 14 persons

Factors Influencing man-animal conflicts:

1. Shrinking of forest compels wildlife to move outside the forest
2. Electric wiring around crops
3. Animals suffer pain and attack humans
4. Female wildlife attack human more to safe its cubs.
5. Forest dept. don't cultivate foods for wild
6. Cash compenstn by Govt – 400/- per quintal But market price 2400/-
7. Garbage near human settlement attract wild

Remedial Measures for conservation of biodiversity:

Make Available of Adequate food & water for wildlife

Construction works in forest must be stopped.

Solar powered fencing must be used to prevent animals

Video Content / Details of website for further learning (if any)

https://www.youtube.com/watch?v=AMX8BqGuqaM

Important Books/Journals for further learning including the page nos.: -
Reference Book: Dr.A.Ravikrishnan page nos 3.23 to 3.27

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L 07

LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental Science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **I-Ecosystem and Biodiversity** **Date of Lecture:**

Topic of Lecture: **Endangered & Endemic Species Of India**

Introduction :

Endangered species of India:

A species is said to be endangered when its no has been reduced to a critical level. Unless it is protected it is in danger of extinction

Endemic species:

The species, which are found only in a particular region are known as endemic species.

62% of endemic species are found in Himalayas and Western Ghats

Prerequisite knowledge for Complete understanding and learning of Topic:

- Extinct Species
- Endangered Species
- Vulnerable Species
- Flora
- Fauna

Detailed content of the Lecture:

ENDANGERED & ENDEMIC SPECIES OF INDIA:

Species are classified into various types:

Extinct species → No longer found in the world

Endangered species → A species is said to be endangered when its no has been reduced to a critical level.

Unless it is protected it is in danger of extinction.

Vulnerable species → when its population is facing continuous decline due to habitat loss.

Rare species → when it is localized within restricted area.

ENDANGERED SPECIES OF INDIA:

A species is said to be endangered when its no has been reduced to a critical level. Unless it is protected it is in

danger of extinction

Important Endangered Species:

Reptiles → Tortoise, green sea turtle, gharial, python

Birds → Peacock, Siberian white crane, pelican, Indian Bustard

Mammals → Indian wolf, red fox, tiger, Indian lion, golden cat, desert cat.

Primates → lion tailed monkey, capped monkey, golden monkey

Plants → medicinal plants, sandal wood tree

RED-data Book = Data book which contains the list of endangered species of plants and animals.

Factors affecting Endangered Species:

Pollution: Human disposal in nature. Travel through food chain and leads to death

Over-exploitation: over usage of natural resources & poaching leads to extinct of wild life

Climate change: ozone depletion, flood etc, threatens organisms and ecosystem

Remedial Measures:

CITES – Convention on International Trade in Endangered Species is signed 2900 and other 900 endangered species are restricted for trade.

ENDEMIC SPECIES:

The species, which are found only in a particular region are known as endemic species.

62% of endemic species are found in Himalayas and Western Ghats

Fauna:

Animals present in a particular region or period is Fauna.

62% amphibians & 50% lizards are endemic to Western Ghats.

(ex) Monitor lizards, reticulated python, Indian salamander, viviparous toad.

Flora:

Plants present in a particular region or period is Flora

(ex) Sapria himalayana, ovaria lurida, pteridophyta, angiosperms etc.

Factors affecting endemic species:

Habitat loss, fragmentation, pollution

Video Content / Details of website for further learning (if any)

https://www.youtube.com/watch?v=wupzdmk3DkM

Important Books/Journals for further learning including the page nos.: -

Reference Book: Dr.A.Ravikrishnan page nos 3.17

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L 08

LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental Science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **I-Ecosystem and Biodiversity** **Date of Lecture:**

Topic of Lecture: Conservation Of Biodiversity

Introduction :

The management of biosphere for the sustainable benefit to meet the needs of future generation.

Need of Biodiversity:

Recreation, tourism, Drugs, herbs, food, important raw materials, preserves plants & animals, hence leads to life supporting systems.

Prerequisite knowledge for Complete understanding and learning of Topic:

- Conservation
- In-situ
- Ex-Situ
- Biodiversity

Detailed content of the Lecture:

Conservation Of Biodiversity

- The convention on Biological Diversity held in June, 1992 stressed the need of the conservation of Biodiversity for sustainable development and perpetuation of human beings on earth.
- Conservation is defined as " the management of human use of the biosphere so that it may yield the greatest sustainable benefit to the present generation while maintaining its potential to meet the needs and aspirations of the future generations".
- The two basic approaches to wildlife conservation in protected habitats are:

1) In- situ conservation
2) 2) Ex- situ conservation.

In- situ conservation

- It simply means conservation of species in its natural ecosystem or even in man made ecosystems.
- This strategy emphasizes protection of total ecosystem through a network of "protected area".
- Protected Areas: an area of land and/or sea specially dedicated to the protection and maintenance of biological diversity and managed through legal effective means.
- There are different categories of protected areas which are managed with different objectives. These include; Biosphere reserves, National parks, Wild Life Sanctuaries etc.
- At present we have 11 major biosphere reserves, 80 National parks, 420 wildlife sanctuaries in our country covering 4% of the geographic area.
- The JIM CORBETT National Park was 1st national park established in India.
- What is Difference among Biosphere reserves, National parks, Wild Life Sanctuaries ? Examples of Biosphere reserves of India:

1. Nilgiri- 5,520 sq.km
2. Nanda Devi- 5,860.69 sq. km
3. Manas – 2837 sq. km
4. Gulf of Mannar – 10,500 sq. km
5. Great Nicobar – 885 sq. km
6. Panchmarhi – 4,926.28 Sq Km Examples of some National park in India
7. 1. Kaziranga- Assam, Gir National Park- Gujarat, Periyar – Kerala, Sariska – Rajasthan Examples of some Wild Life Sanctuaries of India:

1. Ghana Bird sanctuaries
2. Hazaribagh sanctuaries
3. Abohar wild life sanctuaries
4. Jaldapara wild life sanctuaries

5. Mudamalai wild life sanctuaries

Ex- situ conservation

- ❖ It is defined as "the conservation of component of biological diversity (Sample of genetic diversity, particularly of endangered species) outside their natural habitats".
- ❖ It involves maintenance and breeding of endangered plant and animal species under partially or wholly controlled conditions. E.g. Zoos, Botanical Gardens, Aquaria, Nurseries, DNA bank, Seed bank, Gene bank etc.
- ❖ There are more than 1500 Botanical gardens in the world containing more than 80,000 species.
- ❖ There are more than 800 zoos around the world with about 3,000 species of mammals, birds, reptiles and amphibians.

Methods of Ex-situ conservation:

1. NBPGR

National Bureau of Plant Genetic Resources → uses cryo technique

Cryo Technique: Preservation of seeds, vegetables, fruits, crops, etc by using liquid nitrogen at -196^{o} C

2.NBAGR :

National Burea of Animal Genetic Resources → preserves semen of bovine animals

3.NFPRCR:

National Facility for Plants Tissue Culture Respository → preserves crops or trees by tissue culture

Video Content / Details of website for further learning (if any)

https://www.youtube.com/watch?v=PXca53zr9Nk

Important Books/Journals for further learning including the page nos.: -
Reference Book: Dr.A.Ravikrishnan page nos 3.33 to 3.40

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental Science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **I-Ecosystem and Biodiversity** **Date of Lecture:**

Topic of Lecture: Augmented topic – Tiger Poaching in India

Introduction :

The management of biosphere for the sustainable benefit to meet the needs of future generation.

Need of Biodiversity*:*

Recreation, tourism, Drugs, herbs, food, important raw materials, preserves plants & animals, hence leads to life supporting systems.

Prerequisite knowledge for Complete understanding and learning of Topic:

- **Poaching**
- **Wild life Products**
- **Hunting**

Detailed content of the Lecture:

This case study explores the reintroduction of tigers to Sariska Tiger Reserve in Rajasthan, India, highlighting how the (re)negotiation between people and tigers is a struggle rooted in place and territory, with boundaries co-constructed by human and nonhuman actors. While the reintroduction came only three years after the official admission of complete species loss, tigers as a dominant force on the landscape were absent for more than a decade in some places. Accordingly, the people of Sariska see the reintroduced tigers as foreigners without place-knowledge and as disturbers of the interspecies boundaries created by the interactions of Sariska's original tigers and many generations of local people. This study speaks to conservation sciences and animal geography to contribute to the scientific knowledge of the human dimensions of rewilding, still a nascent area of restoration ecology specifically in the case of apex predators in the global south.

POACHING:

Killing / Hunting of animals is poaching.

Types:

Subsistence Poaching- killing animals for surviving.

Commercial Poaching- hunting animals for selling

Factors influencing Poaching:

Human Population: increase in population increases pressure on forest resources.

Commercial activities: Smuggling of wild life products for high profit.

Wildlife products=Furs, horns, tusk, live specimen, herbal products.

Importers of wild life = Europe, North America, Japan, Taiwan, Hong Kong

Examples

- Male gorilla for its body parts
- Blue morpho butterfly – making attractive trays
- Snowy large egret – used for white feather in ladies hat.US
- Elephant feet – for making Ash trays
- Elephant – for ivory
- Bengal tiger – soled for $1,00,000 in foreign market
- Dynamite fishing – high tech fishing, exhaust marine life. Sea horses, Sea turtles

MAN-WILDLIFE CONFLICTS:

Examples:

Sambalpur – orissa:

195 humans were killed by elephants,

In retaliation- 98 elephants were killed, 30 injured by villagers.

Kote – Chamrajanagar –Mysore:

Sugarcane & cotton crop, explosives

Royal Chitwan National Park – Kathmandu

Man-eating tiger killed 16 nepalese, 4 yrs child

Sanjay Gandhi National Park – Mumbai

Leopards killed– 14 persons

Factors Influencing man-animal conflicts:

1. Shrinking of forest compels wildlife to move outside the forest
2. Electric wiring around crops
3. Animals suffer pain and attack humans
4. Female wildlife attack human more to safe its cubs.
5. Forest dept. don't cultivate foods for wild
6. Cash compenstn by Govt – 400/- per quintal But market price 2400/-

7. Garbage near human settlement attract wild

Remedial Measures for conservation of biodiversity:

Make Available of Adequate food & water for wildlife

Construction works in forest must be stopped.

Solar powered fencing must be used to prevent animals

Video Content / Details of website for further learning (if any)

https://www.youtube.com/watch?v=PXca53zr9Nk

Important Books/Journals for further learning including the page nos.: -
Reference Book: Dr.A.Ravikrishnan page nos 3.33 to 3.40

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : II - Natural Resources **Date of Lecture:**

Topic of Lecture: Introduction to Natural Resources

Introduction :

- Resources that occur naturally in the environment are known as natural resources
- Natural resources are the sources which are useful to man or can be transformed into useful product.
- Example: Air, Water, Soil etc.

Prerequisite knowledge for Complete understanding and learning of Topic:

- Renewable resources
- Non-renewable resources

Detailed content of the Lecture:

- Natural resources are classified into two types
- There are Renewable resources and Non-renewable resources
- Renewable resources are capable of being regenerated by ecological processes
- They have the potential to renew themselves
- Example: Soil, Water, Air, Wildlife, Natural vegetation
- The Renewable resources are further classified into two types
- 1. Continuous resources: These resources are continuously renewed
- Example: Solar energy, Wind energy, Tidal energy
- 2. Extrinsic resources: These resources are prone to breakdown or degradation
- Example: Human skills, Institutions, Management abilities
- Non-renewable resources are not capable of being regenerated by ecological processes
- Example: Minerals, Coal, Oil, Natural gas, Ground water

Video Content / Details of website for further learning (if any):

Can be added as link

- http://nptel.ac.in/courses/103107084/
- http://nptel.ac.in.courses/110108056/module5/Lecture32.pdf
- http://nptel.ac.in/courses/Webcourse-contents//IIT

Important Books/Journals for further learning including the page nos.:

Environmental Science and Engineering by Dr. A.Ravirishnan Page No.5.1-5.2

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : II - Natural Resources **Date of Lecture:**

Topic of Lecture: Forest Resources-Uses and benefits, Over exploitation

Introduction :

- Forests are one of the most important natural resources on this earth
- About one-third of the world's land surface is covered with forest
- Forests are used for commercial, ecological, aesthetic and touristic purposes
- Due to overpopulation the materials supplied by forests are not sufficient to meet the people's demand
- Hence exploitation of forest materials is going on increasing day by day

Prerequisite knowledge for Complete understanding and learning of Topic:

- Types of forests
- Functions of forests
- Uses and benefits of forests
- Over-exploitation of forests

Detailed content of the Lecture:

- Forests are classified into three types
- 1. Evergreen forests 2. Deciduous forests 3. Coniferous forests
- **1.Evergreen forests:** These forests found in equatorial regions, where the temperature and rainfall is very high
- Due to heavy rainfall throughout the year these forests are evergreen
- Example: The silent valley in Kerala-Teak, Mahogany, rosewood
- **2.Deciduous forests:** These forests are two types
- A). Tropical deciduous forests- These forests are found in tropical monsoon
- These forests receive only seasonal rainfall, they shed their leaves during the summer season
- Trees- Teak, Sandalwood, Pillaimarudhu
- B). Temperature deciduous forests- Due to severe winter with heavy snowfall the trees shed their leaves before the winter season
- **3. Coniferous forests:** The snow slides down the sloping sides of the trees
- The needle typed leaves preserve the moisture
- Trees-Pine tree, spruce tree
- **Functions of forests:**
- Forests are important both to humans and to nature
- Habitats to millions of plants, animals and wildlife
- Recycle rainwater and remove pollutants from air
- Control water quality and quantity

- Maintain humanity
- Prevent soil erosion
- Promote tourism and contribute aesthetic beauty
- **Benefits of forests:**
- **1.Commercial uses:**

Name of the products		**Uses**
Forests supply wood	-	Used as fuel
Forests supply wood for various Industries	-	Raw materials as pulp,paper, timber
Many plants	-	Preparing medicines and Drugs
Animal products	-	Honey, ivory, hides etc.
Forest lands	-	Mining, grazing, recreation

- **2.Ecological uses:**
  a) Production of oxygen
  b) Reducing global warming
  c) Soil conservation
  d) Regulation of hydrological cycle
  e) Pollution moderators
  f) Wildlife habitat
- **3.Aesthetic value:**
  a) Tribals utilize bamboo wild grass for eracting huts and making mats, baskets, cots etc.,
  b) Alcoholic drinks and medicines are derived from forest plants
  c) Aromatic oils used for lighting and cooking purpose
- **4.Touristic value:**
  Ecotourism provides a growing income for those who have facilitated it
- **Over exploitation of forests:**
- **Causes:**
- Increasing agricultural production
- Increasing industrial activities
- Increase in demand of wood resources
- **Effects:**
- Migration of farmers
- Environmental damage
- Countless plant species and animals are endangered
- Marine population will go to extinction
- Dumping of wastes into land, water
- Tropical forests are destroyed at very fast rate

Video Content / Details of website for further learning (if any):

Can be added as link

- http://nptel.ac.in/courses/103107084/
- http://nptel.ac.in.courses/110108056/module5/Lecture32.pdf

Important Books/Journals for further learning including the page nos.:
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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : II - Natural Resources **Date of Lecture:**

Topic of Lecture: Deforestation

Introduction :

- Deforestation is the process of removal of forest resources due to many natural or man-made activities
- Deforestation is a continuous process
- In India about 1.3 hectares of forest land has been lost

Prerequisite knowledge for Complete understanding and learning of Topic:

- Causes of deforestation
- Effects of deforestation
- Prevention of deforestation

Detailed content of the Lecture:

- **Causes of deforestation:**
  1. **Developmental Projects:**
  a) Through submergence of forest area underwater
  b) Destruction of forest area
  Examples: Bigdams, Hydroelectric projects, Road construction
- **2. Mining operations:**
  Mining operations reduces forest area
  Examples: Mica, Coal, Manganese etc.,
- **3. Raw materials for industries:**
  Wood is the important raw material for so many purposes
  Examples: For making boxes, furnitures, plywood, match-boxes etc.,
  Every year in India, the demand for wood is increased continuously
- **4. Fuel requirements:**
  In India both rural and tribal population is dependent on the forest for meeting their daily need of fuel wood, which leads to the pressure on forest, ultimately to deforestation
- **5. Shifting cultivation:**
  The replacement of natural forest ecosystem for monospecific tree plantation can lead to disappearance of number of plant and animal species
- **6. Forest fires:**
  Forest fire is one of the major causes for deforestation.Due to human interruption

and rise in ambient temperature forest fire happens often nowadays. Thus due to forest fire thousands of forest area gets destructed

- **Effects:**
- **1. Global warming:** Cutting and burning of forest trees increases the CO_2 content in the atmosphere which inturn changes the global climatic, rising sea levels and depletion of the productive ozone layer
- **2. Loss of genetic diversity:** Destruction of forest destroys the greatest storehouse of genetic diversity on earth
- **3. Soil erosion:** 6000 million tons of soil get eroded every year in India
- **4. Loss of biodiversity:** Plants and animals that depend on forest for food and habitat become extinct
- **5. Loss of food grains:** Due to soil erosion, the countries loose the food grains
- **6. Unemployment problems:** The people living around forest areas losses their livelihood
- **7. Flood and Landslides:** Floods, landslides in hilly areas and wind speed are heavy
- **Prevention:**
- Afforestation
- Use of wood for fuel should be discouraged
- Forest pests can be controlled by spraying pesticides by using aeroplanes
- Forest fire must be controlled by modern techniques
- Over grazing by cattle must be controlled
- Steps should be taken by the government to discourage the migration of people into the islands from mainland
- Education and awareness programmes must be conducted
- Strict implementation of law of Forest Conservation Act

Video Content / Details of website for further learning (if any):

Can be added as link

- http://nptel.ac.in/courses/103107084/
- http://nptel.ac.in.courses/110108056/module5/Lecture32.pdf
- http://nptel.ac.in/courses/Webcourse-contents//IIT

Important Books/Journals for further learning including the page nos.:

Environmental Science and Engineering by Dr. A.Ravirishnan page No:5.7-5.10

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LECTURE HANDOUTS

Chemistry

I /II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : II - Natural Resources **Date of Lecture:**

Topic of Lecture: Water resources-uses and over utilization of water

Introduction :

- Water is an important component of all the living beings
- It is circulated in accordance with the hydrological cycle
- Increase in population and industrial growth have increased demand for water resources
- Due to increase of ground water usage, the annual extraction of ground water is in far excess than the natural recharge

Prerequisite knowledge for Complete understanding and learning of Topic:

- Consumptive use
- Non-consumptive use
- Important uses of water
- Effects on over-utilization of water

Detailed content of the Lecture:

- **Consumptive use:**
- Water is completely utilized and it is not reused
- **Example:** In domestic application, industry and irrigation
- **Non-Consumptive use:**
- Water is not completely utilized and it is reused
- **Example:** Hydropower plant
- **Other important uses:**
- Drinking, Cooking, Bathing and Washing
- Sculpting the earth's surface, moderating climate and diluting pollutants
- Water is used for commercial purposes like hotels, theatres, educational institutions, offices, etc.,
- Water is used for irrigation like agriculture. Almost 60-70% of the fresh water is used for irrigation
- 20-30% of the total fresh water is used for so many industrial operations lie refineries, iron and steel, paper and pulp industries
- Water is very essential for the sustainance of all the living organisms
- **Effects on over-utilization of water:**
- **1. Decrease of Ground Water:**
- Due to increased usage of ground water, the ground water level decreases
- **Reason:** a) The erratic and inadequate rainfall results in reduction in storage of water in reservoirs

- b) The building construction activities are reducing the area for percolation of rainwater and increase in surface runoff
- **2. Ground subsidence:** When the groundwater withdrawal is more than its recharge rate, the sediments in the aquifer get compacted which results in sinking of overlaying land surface
- **Problems:** a) Structural damage in buildings
- b) Fracture in pipes
- c) Reversing the flow of canals and tidal flooding
- **3. Lowering of water table:** Over utilization of ground water in arid and semi-arid regions for agriculture disturbs the hydrological cycle
- **Problems:** a) Lowering of water table
- b) Decreased pressure in the aquifers
- **4. Intrusion of salt water:** In coastal area, over- exploitation of ground water would lead to rapid intrusion of salt water from the sea
- **Problem:** Water cannot be used for drinking and agriculture
- **5. Earthquake and landslides:** Over-utilization of ground water leads to decrease in water level, which cause earthquake, landslides and famine
- **6. Drying up of wells:** The level of ground water getting depleted at much faster rates than they can be regenerated
- **7. Pollution of water:** When the ground water level near the agricultural land decreases, the water, containing the nitrogen as nitrate fertilizer percolates into the ground and pollute the ground water

Video Content / Details of website for further learning (if any):

Can be added as link

- http://nptel.ac.in/courses/103107084/
- http://nptel.ac.in.courses/110108056/module5/Lecture32.pdf
- http://nptel.ac.in/courses/Webcourse-contents//IIT

Important Books/Journals for further learning including the page nos.:
Environmental Science and Engineering by Dr. A.Ravirishnan Page No:5.15-5.21

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : II - Natural Resources **Date of Lecture:**

Topic of Lecture: Floods, Drought, Conflicts over water, Dams benefits and problems

Introduction :

- Flood is an overflow of water, whenever the magnitude of flow of water exceeds the carrying capacity of the channel within its banks
- Drought is nothing but scarcity of water, which occurs due to inadequate rainfall, late arrival of rains and excessive withdrawal of ground water
- Due to increase in population and decrease in water resources, conflicts over water starts
- Dams are built across the river to store water for irrigation, hydroelectric power generation and flood control
- Apart from these uses of dams, they have some problems

Prerequisite knowledge for Complete understanding and learning of Topic:

- Causes, effects and management flood
- Types, causes, effects and management of drought
- Causes and management of conflicts over water
- Benefits of constructing dams
- Upstream and downstream problems of constructing dams

Detailed content of the Lecture:

- **Causes of floods:**
- Heavy rainfall, melting of snow, sudden release of water from dams
- Prolonged downpour
- Reduction in carrying capacity of the channel
- Deforestation
- Overgrazing
- Mining
- The removal of dense and uniform forest over the hilly zones
- **Effect of floods:**
- Water spreads in surrounding areas and submerges them
- Plain surface have become eroded and silted with mud and sand, so cultivable land areas gets affected
- Extinction of civilization in coastal areas
- **Flood management:**
- Constructing dams or reservoirs
- Channel management and embankments
- Encroachment of flood ways should be banned

- Flood hazard may also be reduced by flood warning
- Afforestation
- **Types of drought:**
- **1. Meteorological drought:** It occurs when the total amount of rainfall is less than 75% of the normal rainfall
- **2. Hydrological drought:** It occurs when the total amount of rainfall is less than the average rainfall
- **3. Agricultural drought:** It occurs due to the shortage as well as the timing of overall rainfall, which in-turn reduce the ground water and reservoir levels, soil moisture which affects cropped plants
- **4. Socio-economic drought:** It occurs due to reduction in the availability of food and social security of the people in the affected areas which leads to famine
- **Causes:** 1. When annual rainfall is below normal and less than evaporation
- 2. High population
- 3. Intensive cropping pattern and over exploitation of scarce water resources through dug well
- 4.Deforestation
- **Effects:** 1. Hunger, Malnutrition, Scarcity of drinking water
- 2. Degradation of natural resources
- 3. Migration of people
- 4. Urbanization
- 5. Raw materials for agro-based industries are critically affected during drought time, hence retarding the industrial and commercial growth
- 6. Drought causes widespread crop failures leading to acute shortage of food and adversely affects human and livestock populations
- **Drought management:** 1. Rain water harvesting
- 2. To improve ground water level construction of reservoirs are essential in drought area
- 3. Drip irrigation
- 4. Afforestation
- 5. Mixed cropping and dry farming
- 6. Indigenous knowledge in control of drought and desertification
- **Causes of water conflicts:**
- **1. Conflict through use:**
- **a) International conflicts**
- Unequal distribution of water has often led to inter-state or international disputes
  Examples:
- India and Pakistan fight over the rights to water from the Indus
- India and Bangladesh are fighting for Bhrammaputra river
- Iran and Iraq contest for the water from Shatt-al-Arab water
- Mexico and USA have come in conflict over the Colorado river
- **b) National conflicts**
  Examples:
- Sharing of Cauvery water between Karnataka and Tamilnadu
- Sharing of Krishna water between Karnataka and Andhra Pradesh
- Sharing of Siruveni water between Tamilnadu and Kerala
- **2. Construction of dams:** For hydroelectric power generation, dams are built across the rivers, which initiates conflict between the states.
- **3. Conflict through pollution:**
- Rivers and reservoirs are not only used for supply of fresh water but also disposing of waste water and industrial rubbish
- The problem of cleaning the water takes on international conflict
- **Management of conflicts over water:** 1. Control water pollution
- 2. Sharing of river water in the country
- 3. Demand for Nationalisation of water needs serious consideration

- **Benefits of constructing dams:**
- Control flood and store flood water
- Drinking and agricultural purposes
- Generating electricity
- Recreational purposes
- Navigation and fishery can be developed in the dam areas
- Problems of constructing dams:
- **Upstream problems:**
- Displacement of tribal people
- Loss of non-forest land
- Loss of forests, flora and fauna
- Landslips, sedimentation and siltation occurs
- Stagnation and water logging
- Navigation and aquaculture activities can be developed in dam area
- **Downstream problems:**
- Water logging and salinity due to over irrigation
- Reduced water flow and silt deposition in rivers
- Salt water intrusion at river mouth

Video Content / Details of website for further learning (if any):

Can be added as link

- http://nptel.ac.in/courses/103107084/
- http://nptel.ac.in.courses/110108056/module5/Lecture32.pdf
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Important Books/Journals for further learning including the page nos.:

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : II - Natural Resources **Date of Lecture:**

Topic of Lecture: Food resources-Changes caused by overgrazing and agriculture

Introduction :

- Overgrazing is a process of eating away the forest vegetation without giving it a chance to regenerate
- Agriculture is an art, science and industry of managing the growth of plants and animals for human use

Prerequisite knowledge for Complete understanding and learning of Topic:

- Effects of overgrazing
- Types of agriculture
- Effects of traditional agriculture

Detailed content of the Lecture:

- **Effects of overgrazing:**
- **a) Land degradation:** Overgrazing removes the cover of vegetation over the soil and exposed soil gets compacted
- So the roots of the plant cannot go much deep into the soil and the adequate soil moisture is not available
- Thus overgrazing leads to organically poor, dry, compacted soil, which cannot be used for further cultivation
- **b) Soil erosion:** Due to overgrazing by livestock, the cover of vegetation gets removed from the soil
- The roots of the grass are very good binders of the soil
- When the grasses are removed, the soil becomes loose and gets eroded by the action of wind and rainfall
- **Loss of useful species:** Overgrazing affects the composition of plant population and their regeneration capacity
- The grassland consists of grasses and forbs with high nutritive value
- When the livestock grazes the grasses heavily, the root stocks, which carry the food reserve gets destroyed
- Now other secondary species will appear in their place, which are less nutritive in nature
- Some livestock keep in overgrazing these species also
- **Types of agriculture:**
- **1. Traditional agriculture:** It involves a small plot, simple tools, surface water, organic fertilizers and a mix of crops

- They produce enough food to feed their families and to sell it for their income
- **2. Modern agriculture:** It makes use of hybrid seeds of single crop variety, high-tech equipments, lot of fertilizers, pesticides and water to produce large amount of single crops
- **Effects of Traditional agriculture:**
- **a) Deforestation:** Cutting and burning of trees in forests to clear the for cultivation results in loss of forest cover
- **b) Soil erosion:** Clearing of forest cover exposes the soil to wind and rainfall, resulting in loss of top fertile soil layer
- **Loss of nutrients:** During cutting and burning of trees, the organic matter in the soil gets destroyed and most of the nutrients are taken up by the crops within a short period
- Thus the soil becomes poor in nutrient, which makes the farmers shift to another area

Video Content / Details of website for further learning (if any):

Can be added as link

- http://nptel.ac.in/courses/103107084/
- http://nptel.ac.in.courses/110108056/module5/Lecture32.pdf
- http://nptel.ac.in/courses/Webcourse-contents//IIT

Important Books/Journals for further learning including the page nos.:

Environmental Science and Engineering by Dr. A.RavirishnanPage No:5.3-5.40

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L 16

LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code :**Environmental Science and Engineering**

Course Faculty : **Dr.S.Anand**

Unit :**II - Natural Resources** **Date of Lecture:**

Topic of Lecture: Effects of Modern agriculture

Introduction :

- It makes use of hybrid seeds of single crop variety, high-tech equipments lot of fertilizers, pesticides and water to produce large amount of single crops
- To increase the crop variety, farmers use modern agriculture which arise some problems

Prerequisite knowledge for Complete understanding and learning of Topic:

- Problems in using fertilizer
- Problems in using pesticides
- Water logging
- Salinity

Detailed content of the Lecture:

- **1. Problems in using fertilizer:**
- **a) Micronutrient imbalance:** Chemical fertilizers used in modern agriculture contain nitrogen, phosphorous and potassium which are macronutrients
- When excess of the fertilizers are used in the fields it causes micronutrient imbalance
- **b) Blue Baby syndrome:** When the Nitrogeneous fertilizers are applied in the fields, they leach deep into the soil and contaminate the ground water
- The nitrate concentration in the water gets increased
- When the nitrate concentration exceeds 25mg/lit they cause serious health problem called Blue Baby syndrome
- This disease affects infants and leads even to death
- **c) Eutrophication:** N and P fertilizers used in crop fields is washed off by the runoff water and reaches the water bodies causing over nourishment of the lakes
- Due to eutrophication lakes get attacked by algal blooms
- These algal species use up the nutrients rapidly and grow very fast
- Since life time of the algal species are less they die quickly and pollute the water, which inturn affect the aquatic life
- **2. Problems in using pesticides:**
- **a) Death of non-target organisms:** Many insecticides not only kill the target species, but also kill the several non-target species, which are useful to us
- **b) Producing new pests**: Some pest species usually survive ever after the pesticide spray, which generates highly resistant generations
- They are immune to all type of pesticides and are called superpests
- **c) Bio-magnification:** Many of the pesticides are non-biodegradable and keep on

concentrating in the food chain

- These process is called bio-magnification.
- These pesticides in a bio-magnified form is harmful to the human beings
- **d) Risk of cancer:** Pesticides enhance the risks of cancer in two ways
- i) It directly acts as carcinogens
- ii) It indirectly suppress the immune system
- **Desired qualities of an pesticide:**
- i) An ideal pesticide must kill only the target species
- ii) It must be a biodegradable
- iii) It should not produce new pests
- iv) It should not produce any toxic pesticide vapour
- v) Excessive systhetic pesticide should not be used
- vi) Cholorinated pesticides and organophosphate pesticides are hazardous, so they should not be used
- **3. Water logging:** The land where water stand for most of the year
- During water logged conditions, pore-voids in the soil get filled with water and the soil-air gets depleted
- The roots of the plants do not adequate air for respiration which decrease crop yield
- **Causes:**1. Excessive water supply to the croplands
- 2. Heavy rain
- 3. Poor drainage
- **Remedy:** Preventing excessive irrigation, sub-surface drainage technology and bio-drainage by trees like Eucalyptus tree
- **4. Salinity:** The water not absorbed by the soil, undergo evaporation leaving behind a thin layer of dissolved salts in the topsoil
- This process of accumulation of salts is called salinity of the soil
- The saline soils are characterized by the accumulation of soluble salts like sodium chloride, calcium chloride, magnesium chloride, sodium sulphate, sodium bicarbonates and sodium carbonates
- The pH of the water exceeds 8.0
- **Problems:** Due to salinity, the soil becomes alkaline and crop yield decreases
- **Remedy:** Flushing them out by applying good quality water to such soils
- Using sub-surface drainage system

Video Content / Details of website for further learning (if any):

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- http://nptel.ac.in/courses/103107084/
- http://nptel.ac.in.courses/110108056/module5/Lecture32.pdf
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Important Books/Journals for further learning including the page nos.:

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : II - Natural Resources **Date of Lecture:**

Topic of Lecture: Land Resources-Changes caused by land degradation, soil erosion, desertification

Introduction :

- Land is the most important valuable resources for mankind as it provides food, wood, and other biological materials needed for food
- Soil is the mixture of inorganic and organic materials
- Top soil is classified as resource because it is continuously regenerated by natural processes
- If the rate of erosion is faster than rate of renewable then the soil becomes non-renewable resources

Prerequisite knowledge for Complete understanding and learning of Topic:

- Land degradation
- Soil erosion
- Desertification

Detailed content of the Lecture:

- **Land Degradation:** Loss of fertility of the soil
- **Effects:** a) Soil structure are deteriorated
- b) Loss of soil fertility
- c) Water logging
- d) Salinity
- e) Loss of economic social and biodiversity
- **Causes: 1. Population:** As population increases more land is needed for producing food, fibre and fuel wood
- Hence there is more and more pressure on the limited land resources, which are getting degraded due to over exploitation
- **2. Urbanization:** The increased urbanization due to population growth reduces the extent of agricultural land
- To compensate the loss of agricultural land, new lands comprising natural ecosystems such as forests are cleared

- Thus urbanization leads of deforestation, which inturn affects millions of plant and animal species
- **3. Fertilizers and pesticides:** Increased applications of fertilizers and pesticides are needed to increase farm output in the new lands, which again leads to pollution of land and water and soil degradation
- **4. Damage of top soil:**
- Increase in food production generally leads to damage of top soil through nutrient depletion
- **5. Water logging:**
- **6. Soil erosion**
- **7. Salination**
- **Soil erosion:** Process of removal of superficial layer of the soil from one place to another place
- **Types of soil erosion:** a) Normal erosion
- b) Accelerated erosion
- **Effects:** 1. Loss of soil fertility
- 2. Loss of its ability to hold water and sediment
- 3. Sediment runoff can pollute water and kill aquatic life
- **Causes: a) Water:** Water affects soil erosion in the form of rain, run-off, rapid flow, wave action
- **b) Wind:** Wind is the important climatic agent, which carry away the fine particules of soil and creates soil erosion
- **c) Biotic agents:** Overgrazing, mining and deforestation are the major biotic agents, cause soil erosion
- **d) Landslides:** It also causes soil erosion
- **e) Construction:** Construction of dams, buildings, roads removes the protective vegetal cover and leads to soil erosion
- **Control: 1. Conservational till farming:** Tilling machines make slits in the unploughed soil and inject seeds, fertilizers and water in the silt. So the seed germinates and crop grows which control soil erosion
- **2. Contour farming:** Planting crops in rows across the contour of gently sloped land. Each row act as small dam to hold soil
- **3.Terracing:** Conversion of steep slopes into broad terraces, which run across the contour
- **4. Alley cropping:** Planting crops in strips between rows of trees of shrubs that can provide fruits and fuel wood
- **5. Wind breaks:** The trees are planted is long rows along the boundary of

cultivated lands, which bloc the wind and reduce soil erosion

- **Desertification:** Destruction of arid and semiarid lands to desert
- **Effects: 1.** Around 80% of the productive land in the arid and semiarid lands to desert
- **2.** Around 600 million people are threatened by desertification
- **Causes: a) Deforestation:** The process of dending and degrading a forest land initiates a desert
- If there is no vegetation to hold back the rain water, soil cannot soak and groundwater level do not increases
- This also increases, soil erosion, loss of ferility
- **b) Over grazing:** The increase in cattle population heavily graze the grass land or forests and as a result denude the land area
- The denuded land becomes dry, loose and more prone to soil erosion and leads to desert
- **c) Water management:** Over utilization of ground water, particularly in the coastal regions, resulting in saline water intrusion into aquifers, which is unfit for irrigation
- **d) Mining and quarrying:** These activities are also responsible for loss of vegetal cover and denudation of extensive land area leading to desertification
- **e) Climate change:** Formation of deserts may also take place due to climate change, ie., failure of monsoon, frequent droughts
- **d) Pollution:** Excessive use of fertilizers and pesticides and disposal of toxic water into the land also leads to desertification

Video Content / Details of website for further learning (if any):
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- http://nptel.ac.in/courses/103107084/

Important Books/Journals for further learning including the page nos.:
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LECTURE HANDOUTS

Chemistry

I / II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : II - Natural Resources **Date of Lecture:**

Topic of Lecture: Role of an individual in conservation of natural resources

Introduction :

- Resources are being exhaustible, it is the duty of every individual on this earth to conserve natural resources
- Individual must understand the essential of natural resources
- Due to advancement in technology and population growth the present world is facing lot of problems on degradation of natural resources

Prerequisite knowledge for Complete understanding and learning of Topic:

- Conservation of water
- Conservation of soil
- Conservation of forest
- Conservation of food

Detailed content of the Lecture:

- **Conservation of water:**
- 1. Use minimum water for all domestic purposes
- 2. Check water leaks in pipes and toilets and repair them promptly
- 3. Reuse the soapy water for washing off the courtyards, drive ways
- 4. Use drip irrigation
- 5. Build rainwater harvesting system in houses
- **Conservation of soil:**
- 1. Grow different type of plants, herbs, trees and grass in garden which bind the soil and prevent its erosion
- 2. Constructing the house don't uproot the trees as far as possible
- 3. Use of sprinkling irrigation
- 4. Use green manure in the garden
- 5. Use mixed cropping
- **Conservation of forest:**
- 1. Use non-timber products
- 2. Plant more trees and protect them
- 3. Grassing, fishing must be controlled
- 4. Minimize the use of papers and fuel food
- 5. Avoid developmental work like dam, road, construction in forest areas
- **Conservation of food:**

- 1. Eat only minimum amount of food
- 2. Don't waste the food
- 3. Cook only required amount of the food
- 4. Don't cook food unnecessarily
- 5. Don't store large amounts of food grains and protect them from damaging insects

Video Content / Details of website for further learning (if any):

Can be added as link

- http://nptel.ac.in/courses/103107084/
- http://nptel.ac.in.courses/110108056/module5/Lecture32.pdf
- http://nptel.ac.in/courses/Webcourse-contents//IIT

Important Books/Journals for further learning including the page nos.:

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : III – Environmental Pollution **Date of Lecture:**

Topic of Lecture: Definition, causes, control measure of air pollution

Introduction :

Air pollution is created due to the presence of one or more contaminants like dust, smoke, mist and odour in the atmosphere, which are injurious to human beings, plants and animals.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Air pollution
(ii) Pollutants
(iii) Effects
(iv) Control measures

Detailed content of the Lecture:

Definition:

The presence of one or more contaminants like dust, smoke, mist and odour in the atmosphere which are injurious to human beings, plants and animals.

Sources:

- Natural pollution - volcanic eruptions, forest fires, biological decay.
- Man – made activities – Thermal power plants, agricultural activities.

Classification of pollutants:

- *Primary pollutant* – these are those emitted directly in the atmosphere in harmful form like CO, NO.
- *Secondary pollutant* – these may react with one another or with the basic components of air to form new pollutants.

Common air pollutants sources & their effects:

(i) Carbonmonoxide (CO)

Nature

- Colourless, odourless, poisonous gas.
- Formed during incomplete combustion of burning of fuels, motor vehicle

$2C + O \rightarrow 2CO$

Sources

Cigarette smoking, incomplete

Health effects

Causes headaches, anemia, coma,irreversible brain cell damage & death

Environmental effects

Increases the globe temperature

(ii) Nitrogendioxide (NO2)

- Reddish-brown irritating gas & givesphotochemical smog,Can be converted to nitric acid
  - NO2 + Moisture → HNO3
- Fuels burning in vehicles,industrial plants
- Lung irritation & damage
- HNO3 acid deposition damage trees, soils, & aquatic life. Itcorrode metals, stones onbuildings, statues, monuments etc.

(iii) Sulphur dioxide (SO2)

- Colourless, irritating gas. Formed by combustion of coal & oil. Can be converted to sulphuric acid in atmosphere.
- Burning of coal, industrial process
- Breathing problems
- Reduce visibility, acid deposition on trees, soils & aquatic life

(iv) Suspended particulate matter (SPM)

- Includes variety of particles & droplets(aerosols).
- Burning coal in industries, diesel In vehicles, agriculture, unpaved roads, etc
- Nose & throat irritation, lung damage, bronchitis, asthma, cancer Reduce visibility, acid deposition,

(v) Ozone (O3)

- Highly reactive irritating, unpleasant odour gas. A major component of photochemical smog.
- Nitrogen oxides, chemical reaction with volatile organic compounds
- Moderates the climate

(vi) photochemical smog

- Brownish smoke formed during automobile traffic
- Formed due to chemical reaction among nitrogen oxides & hydrocarbon
- Breathing problems, cough, eye, nose & throat irritation, heart diseases,
- Damage plants & trees. Smog reduce visibility

(vii) Lead (Pb)

- Solid toxic metal
- Paint, smelters, lead manufacture, storage batteries, leaded petrol
- Brain & nervous system damage, mental retardation in children, digestive & other health problems, cause cancer
- Can harm wild life

(viii) Chromium

- Solid toxic metal ,
- Paint, smelters, chromium manufacture, chromium plating
- Perforation of nasal septum, chrome holes, ulcer, central nervous system disease, cancer.

Control Measures

1. **Source control**
   - Use only unleaded petrol
   - Use fuels that have low sulphur and ash content

- Plant trees along busy streets because they remove particulates and carbon monoxide and absorb noise.
- Industries and waste disposal sites should be situated outside the city centre.
- Use catalytic converters to help control the emissions of carbon monoxide and hydrocarbons.
- Houses, schools, restaurants & park should not be located on busy street

2. Control measures in Industrial centers

- Emission rates should be restricted to permissible levels
- Air pollution control equipments must be made mandatory
- Continous monitoring of the atmosphere to know the emission level

Video Content / Details of website for further learning (if any)
http://www.iareo.ac.in

Important Books/Journals for further learning including the page nos.: -
Environmental science and engineering, Dr.A.Ravikrishnan, pg.no: 4.2- 4.12

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : III – Environmental Pollution **Date of Lecture:**

Topic of Lecture: water and soil pollution

Introduction :

- Water pollution - the alteration in physical, chemical and biological characteristics of water which may cause harmful effects on human and aquatic life.
- Soil pollution - the contamination of soil by human and natural activities which may cause harmful effects on living beings.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Water pollution

(ii) Soil pollution

(iii) Sources of pollutants

(iv) Control measures

Detailed content of the Lecture:

Water pollution

Definition

Water pollution may be defined as the alteration in physical, chemical and biological characteristics of water which may cause harmful effects on human and aquatic life.

Types, effects and sources of water pollution

1. Infectious agents:

Example: Bacteria, viruses, protozoa and parasitic worms.

Sources: Human and animal wastes.

Effects: Variety of diseases.

2. Oxygen demanding wastes:

Example: Animal manure and plant debris that can be decomposed by aerobic bacteria.

Sources: Sewage, paper mills, and food processing facilities.

Effects: Wastes can degrade quality by depleting water of dissolved oxygen, make aquatic life to die

3 .In organic Chemicals:

Example: Water soluble inorganic chemicals. Compounds of toxic metals such as lead, arsenic and selenium. Salts such as Nacl in water.

Sources: Surface runoff, industrial effluents, household cleansers

Effects: skin cancers & neck damage

Damage nervous system, liver & kidneys

Lower crop yields, Harm fish & other aquatic life

Accelerate corrosion of metals

4. Organic Chemicals:

Examples: Oil, gasoline, plastics, pesticides, cleaning solvents, detergents

Sources: Industrial effluents, household cleansers, runoff from farms

Effects: Causes nervous system damage, cancer, harm fish & wild life.

5. **Radio active materials:**

Example: radioactive isotopes of iodine, radon, uranium,cesium,and thorium

Sources: Nuclear power plants, mining, nuclear weapons production.

Effects; genetic mutation, birth defects, and certain cancers.

6.Point and non-point sources of water pollution

Point sources: These are discharged pollutants at specific locations through pipes, ditches or sewers

eg: factories, sewage treatment plants

Non-point sources: They are usually large areas or air shed that pollute water by runoff

Eg: runoff of chemical from cropland to surface water.

Control measures of water pollution

- The administration of water pollution should be in the hand of state or central government.
- Scientific techniques are needed to control pollution in river, ponds or streams.
- Industrial plants should be based on recycling operations.
- The national goal should be "conservation of forests" and campaign should be "plant more trees".
- Highly qualified and effective persons should be consulted for effective control or water pollution.
- Awareness to public through radio, tv etc>

- Suitable laws, standards and practices should be framed to regulate pollution.
- Basic and applied research in public health engineering be encouraged.
- The possible of reuse or recycling of waste material should be encouraged.
- Companies should not discharge any type of waste either treated or untreated into rivers, lakes, ponds etc.

Soil pollution

Definition

It may be defined as "the contamination of soil by human and natural activities which may cause harmful effects on living beings".

Types

1. Industrial wastes

Sources: Pulp and paper mills, chemical industries, oil refineries, sugar factories,tanneries, textile, steel, fertilizers etc.

Effects: Affect and alter the chemical and biological properties of soil.

Hazardous chemicals enter into human food chain from the soil and finally lead to serious effects.

2. Urban wastes

Sources and effects: Plastics, Glasses, metallic cans, fibers, papers, rubbers, street sweepings, and other discarded
manufactured products. These are also dangerous.

3. Agricultural practices

Sources and effects: Huge quantities of fertilizers, pesticides, herbicides, and weedicides are added to increase the crop yield. Apart from these farm wastes, manure, slurry, are reported to cause soil pollution.

4. Radioactive pollutants

Sources and effects: These are resulting from explosions of nuclear dust and radio active wastes penetrate the soil and accumulate there by creating land pollution.

5. Biological agents

Sources and effects: Soil gets large quantities of human, animal and birds excreta which constitute the major source of land pollution by biological agents.

Control measures of soil pollution

- Population growth
- Decrease of the available farm land due to urbanization
- Forestry and farm practices
- Proper dumping of unwanted materials

- Production of natural fertilizers
- Proper Hygienic condition
- Public awareness
- Recycling and Reuse of wastes
- Ban on Toxic chemicals.

Video Content / Details of website for further learning (if any)
www.geo.lu.lv

Important Books/Journals for further learning including the page nos.: -
Environmental science and engineering, Dr.A.Ravikrishnan, pg.no: 4.12 – 4.19, 4.25 – 4.32

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : III – Environmental Pollution **Date of Lecture:**

Topic of Lecture: Marine pollution

Introduction :

The discharge of waste substances into the sea resulting in harm to living resources, hazards to human health, hindrance to fishery and impairment of quality for use of sea water.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Marine pollution

(ii) Sources of pollutants

(iii) Causes

(iv) Control measures

Detailed content of the Lecture:

Definition

It may be defined as "the discharge of waste substances into the sea resulting in harm toliving resources hazards to human health, hindrance to fishery and impairment of quality for use of sea water".

Source of marine pollution

Dumping the wastes:

Huge amounts of sewage, garbage, agricultural discharge, pesticides, heavy metals, plastics are dumped in sea.

Effects: So many marine birds are affected by gastro-intestinal disorders.

Oil pollution of Marine water:

Caused by petroleum and its products.

Effects: Oil films inhibit photosynthesis & formation of oxygen.

This inhibit the growth of marine plants

Effects of marine pollutants

- Cause more damage in birds as thinning of eggshell and tissue damage of egg.
- Oil spilling causes low body temperature in birds resulting in hypothermia.
- Oil films decreases the rate of oxygen uptake by water.
- Cause damage to marine fauna & flora including algae, fish, birds, invertebrates
- Oil films inhibit photosynthesis & inhibit the growth of the plants
- Hydrocarbon & benzpyrene accumulate in fish & consumption of fish by man cause cancer.

Control measures of marine pollution

- Plants for conserving marine biodiversity must be taken into account of human needs.
- People should be educated about marine ecosystems and the benefits offered by them.
- Local communities must be involved in protecting and managing their coastal resources.
- Social and economic incentives must be offered for conserving and sustainable use of marine resources.
- Governments must manage their own water while extending cooperation to the neighboring states.

Video Content / Details of website for further learning (if any)
http://www.nepa.gov.jm

Important Books/Journals for further learning including the page nos.: -
Environmental science and engineering, Dr.A.Ravikrishnan, pg.no: 4.32 – 4.36

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : III – Environmental Pollution **Date of Lecture:**

Topic of Lecture: Noise pollution

Introduction :

The unwanted, unpleasant or disagreeable sound that causes discomfort for all living beings. Sound intensity is measured in decibel (dB).

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Noise pollution

(ii) Source of noise pollutant

(iii) Causes

(iv) Control measures

Detailed content of the Lecture:

Definition

It may be defined as "the unwanted, unpleasant or disagreeable sound that causes discomfort for all living beings". Sound intensity is measured in decibel (dB).

Types of noise

- Industrial noise (drilling sound, mechanical saws)
- Transport noise (bus, trucks, motors, scooters, rail traffic noise)
- Neighborhood noise (Musical instruments, TV, VCR, Radios, telephones, loudspeakers ets)

Effects of Noise pollution

- This affects human health, comfort and efficiency.
- It causes muscles to contract leading to nervous breakdown, tension.
- It affects health efficiency and behavior.

- loss of hearing due to excessive noise,
- impulsive noise also causes psychological and pathological disorders.
- Brain is also adversely affected by loud and sudden noise as that of jet and aero plane noise.
- Ultrosonic sound can affect the digestive, respiratory, cardio vascular system.
- Rate of heart beat decrease or increase depending on the type of noise
- Blood is also thickened by excessive noises
- Optical system is also affected by noise pollution & lead to colour perception & loss of night vision

Control and preventing measures

- ***Source control*** – acoustic treatment to machine surface, design changes, limiting the operational
- timings.
- ***Transmission path intervention***- the source inside a sound insulating enclosure, construction of a noise barrier or provision of sound absorbing materials.
- ***Oiling*** – Proper oiling will reduce the noise from the machines.
- ***Receptor control***: Protection of the receiver by altering the work schedule, by using ear plugs etc
- ***Planting trees also act as effective noise barriers***
- ***Different absorptive materials can be used to control interior noise.***

Video Content / Details of website for further learning (if any)
www.eagri.org

Important Books/Journals for further learning including the page nos.: -
Environmental science and Engineering, Dr.A.Ravikrishnan, pg.no: 4.37 – 4.41

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : III – Environmental Pollution **Date of Lecture:**

Topic of Lecture: thermal pollution

Introduction :

Addition of excess of undesirable heat to water that makes it harmful to man, animal or aquatic life or otherwise causes significant departures from the normal activities of aquatic communities in water

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Thermal pollution

(ii) Source of thermal pollutant

(iii) Control measures

Detailed content of the Lecture:

Definition

It may be defined as the "addition of excess of undesirable heat to water that makes it harmful to man, animal or aquatic life or otherwise causes significant departures from the normal activities of aquatic communities in water"

Sources of thermal pollution

1. ***Nuclear power plants*** (drainage from hospitals, research institutes, nuclear experiments & explosions,emission from nuclear reactors)
2. ***Coal fired power plants*** (some thermal power plants use coal as fuel, condenser coil are cooled & discharge the hot water back to the nearby lake, & kills the fish & marine organisms)
3. ***Industrial effluents*** (Textile, paper, pulp, sugar industries discharge wastes)
4. ***Domestic sewage*** (Municipal sewage has higher temperature which decrease the dissolved oxygen content & result in foul & offensive smell in water)

5. *Hydro – electric power.*

Effects of thermal pollution

- Reduction in dissolved oxygen
- Increase in Toxicity
- Interference with biological activities
- Interference with reproduction
- Direct mortality
- Food storage for fish.

Control measures of thermal pollution

- Cooling towers - This is used as a coolant. wet cooling tower, dry cooling tower.
- Cooling ponds and spray ponds.
- Artificial lakes – The heated effluents can be discharged into the lake at one end and the
- water for cooling purposes from the other end.

Video Content / Details of website for further learning (if any)
www.eagri.org

Important Books/Journals for further learning including the page nos.: -
Environmental science and Engineering, Dr.A.Ravikrishnan, pg.no: 4.41 – 4.47

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : III – Environmental Pollution **Date of Lecture:**

Topic of Lecture: Nuclear pollution

Introduction :

The radiation hazard in the environment comes from ultraviolet, visible, cosmic rays & microwave radiation which produce genetic mutations in man.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Nuclear pollution

(ii) Sources of pollutant

(iii) Causes

(iv) Control measures

Detailed content of the Lecture:

Definition

The radiation hazard in the environment comes from ultraviolet, visible, cosmic rays & microwave radiation which produce genetic mutations in man.

Sources of Nuclear Hazards:

Natural sources: Space which emits cosmic rays, soil, rocks, air, water, food, radioactive radon-222 etc.

Man-made sources: Nuclear power plants, X-rays, nuclear accidents, nuclear bombs, diagnostic kits etc.

Effects of Nuclear Hazards:

- Causes delirium, convulsions & death within hours or days with brain exposure
- Eye cell die, forming cataracts with eye exposure
- Vomiting, bleeding of the gums, mouth ulcers etc.
- Blood vessel damage is indicated by red spots on the skin

- Nausea, vomiting & Infection of the intestinal wall can kill weeks afterwards
- Unborn children are affected by mental retardation or brain damage.

Control measures from Nuclear Hazards:

- Nuclear devices should never be exploded in air.
- In nuclear reactor coolants may be used to prevent extraneous activation products
- Tightly sealed boxes & closed cycle system can be used to decrease the radioactive emissions
- Production of radioisotopes should be minimized
- Minimum no of nuclear installations should be commissioned
- Fission reactions should be minimized
- The use of radio isotopes may be carried under jet of soil or water instead of gaseous forms
- Wet drilling may be employed along with underground drainage
- Extreme care should be exercised in disposal of industrial wastes
- Use of high chimneys & ventilations at the working place for dispersing radio-pollutants
- Disposal methods are the possible ways to distribute the radio-pollutants

Disposal of Radioactive wastes:

High level wastes(HLW) = They are dangerous & so converted them into inert solids & then buried deep into earth or stored in deep salt mines. Ex. Spent nuclear fuel.

Medium level wastes (MLW) = MLW are solidified & are mixed with concrete in steel drums before buried in deep mines.

Low level wastes (LLW)= LLW are disposed off in steel drums in concrete lined trenches.

Video Content / Details of website for further learning (if any)
www.eagri.org

Important Books/Journals for further learning including the page nos.: -
Environmental science and Engineering, Dr.A.Ravikrishnan, pg.no: 4.47 – 4.51

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : III – Environmental Pollution **Date of Lecture:**

Topic of Lecture: Solid waste management, disaster management

Introduction :

Solid wastes can be managed by following any one of the discarded techniques like landfill, incineration and composting.

Disaster management – Disasters like flood, cyclone, landslide, earthquake and tsunami can be managed by following preventive measures.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Solid wastes
(ii) Landfill, composting, incineration
(iii) Disasters
(iv) Cause, preventing measures of disaster management.

Detailed content of the Lecture:

Solid waste management

Solid waste generation

↓

Collection of wastes

↓

Transportation

↓

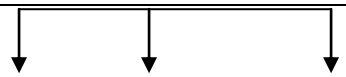
Storage

↓

Segregation of waste

↓

Disposal methods



Landfil Incineration Composting

Steps Involved

I Reduce, Reuse, Recycling (3R)

a) Reduce the usage of raw materials:

Usage of raw materials is reduced.

b) Reuse: refillable container which is discarded after using can be reused.

Throwing rubber ring from cycle tubes can be used again in the manufacture of rubber bands.

c) Recycling: recycling of discarded materials into new products.

Eg:

i) Preparation of new cans and bottles from old aluminum cans and glass bottles.

ii) Preparation of fuel pellets from kitchen waste.

II Discarding wastes:

Methods: a) Land fill b) Incineration c) Composting

a)Land fill:

- Solid wastes are placed in sanitary landfill system in alternate layers of 80cm thickness of refuse
- Covered with selected earth fill of 20 cm thickness
- After 2 or 3 days solid wastes volume shrinks by 25-30%
- Then the land is used for parks, roads, small buildings etc.

Advantages

- Simple and economical
- Segregation is not required
- Landfill areas can be used for other purposes
- Natural resources are retained to the soil.

Disadvantages:

- Large area is required
- Transportations cost is heavy.
- Bad odors, if landfill is not properly managed
- Insecticides, pesticides should be applied at regular
- intervals
- Causes of fire hazards due to formation of methane

b)Incineration (or) Thermal process

- In this method combustible substances (rubbish, garbage, dead organisms) & non-combustable
- substances (glass, porcelain, metals) are separated first.
- The combustible waste substances are first dried in a preheater
- Then it is taken in a large incinerating furnace which incinerate about 100 to 150 tonnes per hour
- The temperature is maintained between 700^{o}C to 1000^{o}C
- The left out ashes & clinkers from the furnace is further disposed by landfill method
- The heat produced in the incinerator is used for generating electricity though turbines
- The non combustible substances are left out for recycling & reuse. Need skilled persons

Advantages:

- Require little space
- Cost of transportation is not high
- Safest and hygienic
- Capacity 300 tonnes per day and can generate 3MV of power.

Disadvantages:

- Capital and operating cost is high
- Formation of smokes, dusts, and ashes.

c) Composting:

- In this method the bulk organic waste is converted into fertilizer by biological action
- The separated compostable waste is dumped in underground trenches(1.5m)
- Covered with earth of 20 cm and left over for decomposition
- Micro organism (actinomycetes) is introduced to start decomposition.
- After 2 or 3 days the organic waste are destroyed bt micro organism and produce heat
- Composting will happen at 75^{o}C
- Finally the refuse can converted to powdery brown colored odorless mass called Humus(fertilizer).
- It contains lots of nitrogen, plants growth phosphates and other minerals.

Advantages:

- Increase of water retention and ion exchange character of soil
- Number of industrial waste can also be treated by this method
- Manure can be produced
- Recycling occurs.

Disadvantages:

- Non combustible have to disposed separately
- No assured market

DISASTER MANAGEMENT

Hazard

It is a perceived natural event which threatens both life and property.

Disaster

- A disaster is the realization of this hazard
- It is defined as the geological process and it is an event concentrated in time and space in which a
- society or subdivision of a society undergoes severe danger and causes loss of its members and physical property.

Types

Natural disasters – refers to those disasters that are generated by natural phenomena.

Man made disasters – refers to the disasters resulting from man made hazards.

FLOODS

Whenever the magnitude of water flow exceeds the carrying capacity of the channel within its banks the excess of water overflows on the surroundings causes floods.

Causes of floods

- Heavy rain, rainfall during cyclone causes floods
- Sudden snow melt also raises the quantity of water in streams and causes flood
- Sudden and excess release of impounded water behind dams
- Clearing of forests for agriculture has also increased severity of floods.

Flood Management

- Encroachment of flood ways should be banned.
- Building walls prevent spilling out the flood water over flood plains.
- Diverting excess water through channels or canals to areas like lake, rivers where water is not sufficient.
- Optical and microwave data from IRS is also used for flood management.
- Flood forecasts and flood warning are also given by the central water commission.

CYCLONES

It is a meteorological process, intense depressions forming over the open oceans and moving towards the land.Cyclone is measured by Saffir-Simpson scale.

Effect

- The damage depends on the intensity of cyclone the damage to human life, crops, roads, transport,could be heavy.
- Cyclone occurrence slows down the developmental activities of the area.

Cyclone management

Satellite images are used by meteorological departments for forecasting the weather conditions which

reveal the strength and intensity of the storm. Radar system is used to detect the cyclone and is being used for cyclone warning.

LAND SLIDES

The movement of earthy materials like coherent rock, mud, soil and debris from higher to lower region to gravitational pull is called land slides.

Causes

- Movement of heavy vehicles on the unstable sloppy regions.
- Earthquake, shocks, vibrations and cyclone.

Effects of landslides

1. Block roads and diverts the passage.
2. Soil erosion increases.
3. Causes damages to houses, crops and live stock.

EARTH QUAKES

An earthquake is a sudden vibration caused on earth surface with the sudden release of tremendous energy stored in rocks under the earth's crust.

Causes

1. Disequilibrium in any part of the earth crust
2. Underground nuclear testing
3. Decrease of underground water level.

Severity of an earthquake: Generally it is measured by its magnitude on Richter scale.

Effect

- Damage the settlements and transport systems
- Collapses houses and their structures
- Deformation of ground surface

Earthquake Management

- Constructing earthquake resistant building
- Wooden houses are preferred
- Seismic hazard map should give the information about the magnitude of intensity of anticipated earthquakes.

TSUNAMI

A tsunami is a large wave that is generated in a water body when the seafloor is deformed by seismic activity.This activity displaces the overlying water in the ocean.

Causes of tsunami

- Seismic activities like earthquakes, landslides, volcanic eruptions, explosions, can generate tsunami.
- Deformation of the sea floor due to the movement of plates.

Concept of Tsunami

A tsunami is not a single wave but a series of waves like the ordinary waves which we see on seas.

Effects on Tsunami

- Tsunami attacks mostly the coastlines, causing devastating property, damage and loss of life.
- Tsunami can kill lot of human beings, livestock's.
- Tsunami may also spread lot of water borne diseases.

Tsunami Management

- Earthquakes under the water are monitored by sensors on the floor of the sea.
- The sensors send the information of floating buoys on the surface, whenever they detect any changes in pressure of the sea.
- The information is then relayed to satellites, which passes it on to the earth stations.
- Finally the country make the people alert through the media to take all necessary precautions.

Video Content / Details of website for further learning (if any)

www.uap-bd.edu, https://www.cartercenter.org

Important Books/Journals for further learning including the page nos.: -

Environmental science and engineering, Dr.A.Ravikrishnan, pg.no: 4.51 – 4.60, 4.70 – 4.82

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : III – Environmental Pollution **Date of Lecture:**

Topic of Lecture: Role of individual in prevention of pollution

Introduction :

Individuals play an important role in the causes of pollution. Our environment is polluted daily due to the man made activities. There is a role of individual in the prevention of pollution by following simple steps.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Pollution

(ii) Pollutant

(iii) Causes of pollution

(iv) Prevention of pollution

Detailed content of the Lecture:

Role of individual in prevention of pollution

- Plant more trees
- Help more in pollution prevention than pollution control
- Use water, energy and other resources efficiently
- Purchase recyclable, recycled and environmentally safe products
- Reduce deforestation
- Remove NO from motor vehicular exhaust
- Use of eco friendly products.
- Use CFC free refrigirators
- Use natural gas than coal
- Use machines in well ventilated areas
- Use less polluting substances for cleaning agents, paints & other products

- Increase use of renewable resources
- Don't use polystyrene cups that have chloro fluoro carbon (CFC) which destroy ozone
- Use rechargeable batteries which will reduce metal pollution
- Use organic manure instead of inorganic fertilizers
- Reduce garbage by recycling & reuse, Slow population growth

Video Content / Details of website for further learning (if any)
https://www.epa.gov

Important Books/Journals for further learning including the page nos.: -
Environmental science and engineering, Dr.A.Ravikrishnan, pg.no: 4.61 – 4.63

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental Science and Engineering / 19BSS12

Course Faculty : Dr.S.Anand

Unit : III – Environmental Pollution **Date of Lecture:**

Topic of Lecture: Bhopal gas tragedy (Augmented topic)

Introduction :

Bhopal gas tragedy was named as tragedy due to the explosion of nuclear reactor during manufacture of carbamate pesticide. During explosion, methyl isocyanate (toxic gas) was released.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Nuclear reactor

(ii) Methyl isocyanate

(iii) Toxic gas

(iv) Effects of explosion of nuclear reactor

Detailed content of the Lecture:

BHOPAL GAS TRAGEDY:

- On night of 3rd December 1984 in Bhopal city of Madhya Pradesh
- At Union carbide India Ltd, which manufacture carbonate pesticides using methyl isocyanate (MIC)
- Due to failure of coolant, the reactor got exploded & 40 tons of MIC leaked over 40 sq.km area.

Nature of MIC:

It is a toxic gas, affects lungs, eyes & causes irritation in skin. Remove oxygen from lungs & cause death.

Effects in Bhopal:

- About 5000 persons died, 1000 became blind, 65,000 people suffered from eye, respiratory, neuromuscular problems.
- Eyes: chronic conjunctivitis, scars on cornea, early cataracts
- Respiratory tracts: Obstructive or restrictive disease, pulmonary fibrosis, aggrevation of TB and chronic bronchitis
- Neurological system: Impairment of memory, finer motor skills, numbness
- Children' health: peri and neonatal rates increased.

Video Content / Details of website for further learning (if any)
https://en.m.wikipedia.org

Important Books/Journals for further learning including the page nos.: -
Environmental science and engineering, Dr.A.Ravikrishnan, pg.no: 4.95 – 4.96

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **IV - Social Issues and the Environment** **Date of Lecture:**

Topic of Lecture: From unsustainable to sustainable development. Urbanization

Introduction :

There is a need to develop and modernize the technologies without losing our sound traditional values and practices. True sustainable development aims at optimum use of natural resources with high degree of reusability, minimum wastage, least generation of toxic byproducts and maximum productivity

Prerequisite knowledge for Complete understanding and learning of Topic:

The student should expected to have primary knowledge about

- Environment
- Development
- Urbanization
- Migration

Sustainable Development:

Meeting the needs of the present, without compromising the ability of future generations, to meet their own needs.

Dimensions of sustainable development:

Derived from interactions between society, economy and environment.

- ✓ We live in a natural as well as social world
- ✓ Development cannot be of only the rich
- ✓ Development means only high living standards.

Aspects of sustainable development:

- ✓ Inter-generational equity = states to hand over safe, healthy & resourceful environment to future generation.
- ✓ Intra-generational equity = Technological development of rich countries should support the economic growth of poor countries.

Approaches for sustainable development:

Developing appropriate technology;

locally adaptable, eco-friendly, resource efficient and culturally suitable.

- ✓ ***Reduce, reuse, recycle [3R] approach*** – reduces waste generation and pollution
- ✓ ***Providing environmental education and awareness*** – changing attitude of the people
- ✓ ***Consumption of renewable resources*** – attain sustainability
- ✓ ***Conservation of non renewable resources*** – conserved by recycling and reusing
- ✓ ***Population control.***

Unsustainable to Sustainable Development:

It is the prime duty of every citizen of the world to think and engage in environment friendly activities.

The following are the most important steps to be undertaken:

- ✓ Environmental education is required to improve understanding among general public about the environment.
- ✓ The awareness must be given to understand the relationship between human and their environment. Understanding of basic ecological concept and current environmental issues will help in solving environmental problems.
- ✓ Make the people to understand environmental protection and resource conservation are the main advantages to lead a better life. The concept of sustainable development can be explained more accurately with the help of understanding the environment

Urbanization:

Urbanization is the movement of human population from rural areas to urban areas for the want of better education, Communication, health, employment, etc

Urban problems related to energy:

- ✓ Cities are the main centers of economic growth, trade, education, employment
- ✓ Now 50% population lives in Urban areas
- ✓ Urban sprawl
- ✓ Difficult to accommodate
- ✓ Uncontrollable and unplanned growth
- ✓ Densely populated, consume more resources, Need More Energy

Solutions:

- ✓ **Combat poverty by promoting economic development and job creation.**
- ✓ **Involve local community in local government.**
- ✓ **Reduce air pollution by upgrading energy use and alternative transport systems.**
- ✓ **Create private-public partnerships to provide services such as waste disposal and housing.**

✓ **Plant trees and incorporate the care of city green spaces as a key element in urban planning.**
Video Content / Details of website for further learning (if any): https://www.youtube.com/watch?v=AxdkXL4fwyU
Important Books/Journals for further learning including the page nos.: - Environmental Science and Engineering by Dr. A. Ravikrishnan, PageNo.6.2 to 6.6

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **IV - Social Issues and the Environment** **Date of Lecture:**

Topic of Lecture: Water Conservation, Rainwater Harvesting

Introduction :

Rainwater **harvesting** is a technology used for collecting and storing **rainwater** from rooftops, the land surface or rock catchments using simple techniques such as jars and pots as well as more complex techniques such as underground check dams.

Water conservation and management encompasses the policies, strategies and activities made to manage **water** as a sustainable resource, to protect the **water** environment, and to meet current and future human demand. Population, household size, and growth and affluence all affect how much **water** is used.

Prerequisite knowledge for Complete understanding and learning of Topic:
(Max. Four important topics)

- Importance of water
- Types of water bodies
- Hydrological cycle
- Effect of water

Detailed content of the Lecture:

WATER CONSERVATION

The process of saving water for future utilization is known as water conservation.

Need for water conservation

- ☐ Changes in environmental factors
- ☐ Better lifestyles need more water
- ☐ Increase in population
- ☐ Deforestation decreases annual rainfal
- ☐ Over exploitation of ground water leads to drought
- ☐ Agricultural and industrial activities require more water.

Strategies of water conservation

Reducing evaporation losses → can place asphalt below the soil surface

Reducing irrigation losses → sprinkling, drip irrigation, irrigation in early Morning / later evening reduces evaporation

Re use of water → treated waste water from washings, bathrooms can be used for gardening

Preventing of wastage of water → closing taps when not is use, repairing leakage, using small capacity taps etc

Decreasing run-off losses. → Can be done by using contour cultivation or terrace farming

Avoid discharge of sewage → discharge of sewage into water resources should be prevented

RAINWATER HARVESTING:

It is technique of capturing & storing of rainwater for further utilization

Objectives of rain water harvesting (1)

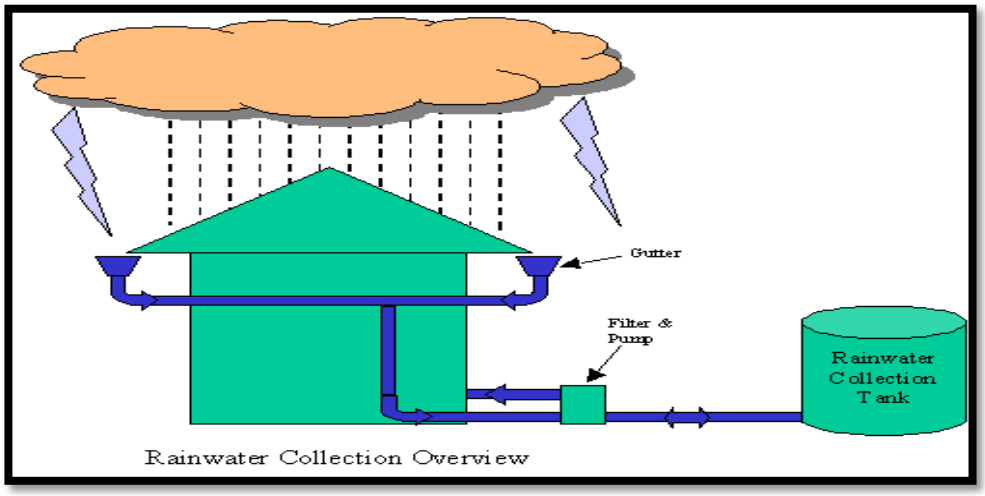
- To meet the increasing demands
- Raise the water table by recharging the ground water
- Reduce ground water contamination
- Reduce the surface run off loss & soil erosion
- Increase in hydro static pressure.
- Minimise water crisis & water conflicts

Roof top Rainwater Harvesting Method:(2)

- Method of collecting rainwater from roof of the building & storing it in the ground for future use.
- Rain water is collected by PVC / aluminium pipe to the pit
- The pit base is filled with stones & sand, which serve as sand filters

Advantages of Rain water Harvesting (3):

- Reduces the use of current
- Prevent drought
- Increase the water level in well
- Rise in ground water level
- Minimise soil erosion & flood hazards
- Upgrading the social & environmental status
- Future generation is assured of water.



Video Content / Details of website for further learning (if any);

https://www.youtube.com/playlist?list=PL05LsqthD5X8Kon7iCW7whmMR2VhopCll

Important Books/Journals for further learning including the page nos.: - Environmental Science and Engineering by Dr. A. Ravikrishnan, PageNo.6.8 to 6.11,

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LECTURE HANDOUTS

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Chemistry

I/II

Course Name with Code : **Environmental science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **IV - Social Issues and the Environment** **Date of Lecture:**

Topic of Lecture: Water Shed Management, Resettlement and Rehabilitation of People

Introduction :

It involves conservation, regeneration and proper use of water. Resettlement and rehabilitation is one of the most serious problems caused by the development activities. Besides this, the native people are directly affected.

Prerequisite knowledge for Complete understanding and learning of Topic:
(Max. Four important topics)

- Dams
- Development project
- Disaster
- Water bodies

Watershed

It is defined as the land area from which water drains due to gravity into stream, lake etc.The management of rainfall and resultant run-off is called ***watershed management.***

Objectives :

- ✓ To minimize of risk of floods
- ✓ For improving the economy
- ✓ For developmental activities
- ✓ To generate huge employment opportunities
- ✓ To promote forestry
- ✓ To protect soil from erosion.

Factors affecting watershed :

- ✓ Unplanned, uncontrolled, unscientific land use activities
- ✓ Deforestation, overgrazing, mining, construction
- ✓ activities
- ✓ Droughty climates affects the watershed.

Watershed management Techniques (3):

- ✓ Trenches (Pits)

- ✓ Earthern dam
- ✓ Farm pond
- ✓ Underground barriers (Dykes)

Maintenance of Watershed (4):

- ✓ Water harvesting
- ✓ Afforestation
- ✓ Reducing soil erosion
- ✓ Scientific mining & Quarrying
- ✓ Public participation Minimizing livestock population

Resettlement and Rehabilitation of People

Displacement of human population

Causes:

Due to Developmental activities = dams, mining, roads, airports, etc

Due to Disaster **(Natural disaster)** = earthquake, floods, droughts, landslides, avalanches, volcanic eruptions etc.

(Manmade disasters = Industrial accidents, nuclear accidents, dam bursts etc)

Due to conservation initiatives = national park, sanctuary, forest reserves, biosphere reserve etc.

EFFECTS

- ✓ Loss of land.
- ✓ Social and cultural problems.
- ✓ Changes in tradition of indigenous people.
- ✓ Spread of disease.
- ✓ Submergence of valuable forest.
- ✓ Water logging.
- ✓ Extinction of wild life.

Resettlement:

It is simple relocation / displacement of human population.

Rehabilitation:

Involves making the system to work again by replacing the lost economic assets, employment, land for building,repair damaged building etc.

Rehabilitation issues

- ✓ Displacement of tribal's increases poverty by losing home, land, jobs, food security etc
- ✓ Breakup of families
- ✓ Communal ownership of property
- ✓ Vanishing social and cultural activities like folk songs & dances

- ✓ Loss of identity between the people.

Examples: Sardar Sarovar Dam, the Theri dam Project, Pong Dam.

Rehabilitation Policy

- ✓ A sound national policy on rehabilitation and resettlement of affected people are essential.
- ✓ The Resettlement and Rehabilitation work should be a part of the project and all those affected should be rehabilitated before the commencement of the project.
- ✓ The people should be rehabilitated on "minimum dislocation basis", by choosing adjacent areas.
- ✓ The extent of rehabilitation should meet the ends of social justice and balanced development.

Video Content / Details of website for further learning (if any):
https://www.youtube.com/watch?v=QP-HKfxmS60

Important Books/Journals for further learning including the page nos.: - Environmental Science and Engineering by Dr. A. Ravikrishnan, PageNo.6.11 to 6.18, Water Shed Management, Resettlement and Rehabilitation of People

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **IV - Social Issues and the Environment** **Date of Lecture:**

Topic of Lecture: Environmental Ethics,Climate Change

Introduction :

It means that efforts must be taken to protect an environment and to maintain its stability from the hazardous chemical pollutants. The sun heats the earth; solar radiation passes through the atmosphere, and is absorbed at the earth's surface. It's similar to the warming effect observed in the horticultural made of glass.

Prerequisite knowledge for Complete understanding and learning of Topic:

- ✓ Environmental uses
- ✓ Environmental problems
- ✓ Green house gases

Detailed content of the Lecture:

Environmental Ethics:

Environmental ethics refers to the issues, principles and guidelines relating to human interactions with their environment.

Function of Environment :

- ✓ A life supporting medium for all organisms
- ✓ It provides food, air, water, & other natural resources urbanisation
- ✓ Moderates the climatic conditions smoke
- ✓ Disintegrates the waste discharged by the society
- ✓ Healthy economy depends on healthy environment. ☐

Environmental problems:

- ✓ Deforestation
- ✓ Land degradation.
- ✓ Pollution due to effluent and

- ✓ Water scarcity
- ✓ Population growth &

Solutions to environmental problems:

- ✓ Reducing the energy sources & waste production
- ✓ Recycle and reuse of waste products
- ✓ Soil degradation must be minimized
- ✓ Sustainable development by conservation on resources
- ✓ Over-exploitation of natural resources must be reduced
- ✓ Protection of Bio – diversity
- ✓ Reducing the population & increase the economic growth.

Ethical Guideline

- ✓ Love & honour the earth
- ✓ Should be grateful to plants & animals
- ✓ Should not waste your resources
- ✓ Should not steal from future generation

✓ Should not pollute & hold other living things

✓ Should not consume more materials

✓ Should share the precious earth resources

Climate Change:

A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

There are approximately five main climate types on Earth:

- ✓ Tropical
- ✓ Dry
- ✓ Temperate
- ✓ Continental
- ✓ Polar

Challenges :

Forests: Climate Change brings about shift in natural vegetation, thereby deteriorating the forests

Agriculture: Rain-deficit monsoon and unseasonal rains have disturbed the crop-cycles

Water: Some parts of India are facing shrinking of water supplies, others are facing rising seas

Biodiversity: Climate change, along with habitat loss and fragmentation is a major threat to Biodiversity

Solution:

- ✓ Promotion of Public transport and vehicle-pooling can lower the carbon emissions to great levels. **Piezo-technology** can be tapped, which is eco-friendly.
- ✓ Climate impacts in India are not uniform. Populace of low socio-economic status is more vulnerable to the health impacts of climate change, as they have the least adaptive capacity.
- ✓ Educating people about the evils of global warming and climate change. Combating climate change is all about bringing a change in one's lifestyle.

Video Content / Details of website for further learning (if any): https://www.youtube.com/watch?v=-Wa8ICECr3w

Important Books/Journals for further learning including the page nos.: - Environmental Science and Engineering by Dr. A. Ravikrishnan, PageNo.6.18 to 6.21

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **IV - Social Issues and the Environment** **Date of Lecture:**

Topic of Lecture: Acid Rain, Ozone Layer Depletion

Introduction :

Acid rain is formed when chemicals such as sulfur dioxide (SO_2) or nitrogen oxides (NO_x) react with water in the atmosphere to form mild solutions of sulfuric or nitric **acid**. ... Burning coal and oil and volcanic eruptions produce sulfur dioxide while the cars and lightning strikes produce nitric oxides

Ozone depletion, gradual thinning of Earth's **ozone layer** in the upper atmosphere caused by the release of chemical compounds containing gaseous chlorine or bromine from industry and other human activities.

Prerequisite knowledge for Complete understanding and learning of Topic:
(Max. Four important topics)

- ✓ Concept of acid and base
- ✓ Air pollution
- ✓ Effect of acid
- ✓ Important of ozone layer

Detailed content of the Lecture:

Acid Rain:

Normal rain is slightly acidic due to CO_2 gas.The pH of the rain water is further acidic due to SO_2 & NO_2 gases.This type of precipitation of water is called acid rain.

Formation of Acid rain:

Thermal power plants, industries,& vehicles release nitrous oxide & sulphur dioxide into atmosphere

When these gases react with water vapour they form acids

$$SO_x + H_2O \rightarrow H_2SO4 \quad , \quad NO_x + H_2O \rightarrow HNO3$$

Effects of acid rain

- ✓ ***On Human beings***
  - Destroy life – nervous, respiratory and digestive system
  - Causes premature death from heart and lung disorders like asthma & bronchitis.

- ✓ ***On Buildings***
  - Taj Mahal in Agra suffer due to H_2 SO4 acid fumes released from Mathura refinery.
  - British Parliament building suffered due to H_2 SO4 rain
  - Acid rain reduce the value of building, bridges, cultural objects etc.
  - This increases the maintenance cost.
- ✓ **On terrestrial and Lake Ecosystem**
  - Reduces rate of photosynthesis, growth of crops, Fish population.
  - Flies, mosquitoes & worm occur on the dead fishes
  - Nitrogen, & phosphorous stay up in dead wastages.
  - Biomass production is reduced & fish population decreases.

Control measures:

- ✓ By Clean combustion technologies
- ✓ Using pollution control equipments
- ✓ Replacement of coal by natural gas
- ✓ Liming of lakes and soils.
- ✓ Coal with lower sulphur content can be used
- ✓ Emission of SO_2 & NO_2 from industries can be reduced

Ozone Layer Depletion:

Ozone gas O_3 found throughout the atmosphere is formed in the stratosphere by photo - chemical reaction.

It protects us from the Ultraviolet radiation of the sun.

Recent evidence shown that ozone layer is becoming thinner & holes have developed.

Ozone depleting chemicals:

- ✓ Chloro Fluro carbon (CFC)[Used in refrigerators, propellent, spray cans, blowing agent, foam agent],
- ✓ Hydro chloro fluoro carbon (HCFC), [Used in refrigerants, blowing agents]
- ✓ Bromo fluoroCarbon (BFC)[Used in fire extinguisher].

Formation of Ozone:

$$O_3 + h\nu \rightarrow O\bullet + O_2 , \quad O\bullet + M \rightarrow O + M$$

[Ozone is formed by photochemical reaction]

[atomic oxygen reacts with molecular oxygen to form ozone, M = third body like Nitrogen]

Mechanism of Ozone layer depletion:

- ✓ In 1970 it was found that ozone layer was attacked by CFCs
- ✓ Each Chlorine atom attack ozone molecule.In 1970 it was found that ozone layer was attacked by CFCs. Each Chlorine atom attack ozone molecule.

$$CF_2Cl_2 \rightarrow CF_2Cl\bullet + Cl\bullet$$

$$Cl\bullet + O_3 \rightarrow ClO\bullet + O_2$$

$$O_3 + hv \rightarrow O\bullet + O_2$$

$$ClO\bullet + O\bullet \rightarrow Cl\bullet\bullet + O_2$$

Effects

- ✓ **On human health** – Skin cancer, Non melanine skin cancer, slow blindness called keratitis,cataracts, Allergies, reduces human resistivity, infectious diseases etc.
- ✓ **On aquatic systems**- Affects phyto plankton which absorb more CO , affects fish, larval crabs
- ✓ **On materials**- Degradation of paints, plastics, & other polymeric material result in economic loss.
- ✓ **On climate** – increasing the average temperature of the earth surface & cause global

The amount of ozone is measured by Dobson spectrometer & expressed in Dobson units (DU). 1 DU is equivalent to a 0.01 mm thichkness of pure ozone at 1 atm pressure.

Control Measures:

- ✓ Replacing CFCs by less damaging materials
- ✓ Use of methyl bromide – crop fumigant should be controlled
- ✓ Manufacturing & using of ozone depleting chemicals should be stopped.

Video Content / Details of website for further learning (if any):
https://www.youtube.com/watch?v=krKyo6eAk5E

Important Books/Journals for further learning including the page nos.: - Environmental Science and Engineering by Dr. A. Ravikrishnan, PageNo.6.18 to 6.21

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **IV - Social Issues and the Environment** **Date of Lecture:**

Topic of Lecture: Global Warming, Nuclear Accidents & Holocaust

Introduction :

The prime example of a "major nuclear accident" is one in which a reactor core is damaged and significant amounts of radioactive isotopes are released, such as in the Chernobyl disaster in 1986. ... Nuclear power accidents can involve loss of life and large monetary costs for remediation work.

Prerequisite knowledge for Complete understanding and learning of Topic:

(Max. Four important topics)

- Green house gas
- Nuclear fission
- Nuclear fusion
- Radioactive materials

Detailed content of the Lecture:

Green House Effect:

The progressive warming of earth surface due to blanketing effect of man made CO_2 in the atmosphere is ***green house effect.*** Green house gases- causing global warming are CO_2 , CH_4 , N_2O, CFCs. CO_2 is the most important green house gas. Human activities increase the green house effect & raise the atmospheric temperature & this is called ***global warming.***

Effect on global warming:

- ✓ ***Sea level:*** glacial melting & thermal expansion of ocean raise the sea level
- ✓ ***Agriculture and forestry***: Climatic pattern shifts,rainfall is reduced,soils are dried, result in drought,less crop production
- ✓ ***Water resources:*** Rainfall pattern change,Drought & Floods will become common, Rise in temperature will increases water demand.
- ✓ ***Terrestrial ecosystems:*** Animals & plants will have problems in adapting, They will be in

Risk of extinction

- ✓ ***Human health:*** As earth become warmer, floods & droughts become frequent This increase waterborne diseases, infectious diseases caused by mosquitoes.

Preventive Measures of Global Warming:

- ✓ Reducing CO_2 emission by reducing use of fossil fuels
- ✓ Utilizing renewable resources like wind, solar, hydro power etc.
- ✓ Plant more trees
- ✓ Adopt sustainable agriculture.
- ✓ Use natural gas instead of coal
- ✓ Stabilize population growth
- ✓ Remove CO_2 by photosynthetic algae.

Nuclear Accidents & Holocaust:

The release of large amounts of nuclear energy and radioactive products into the atmosphere.

Examples

- ✓ ***Bhopal gas tragedy:***

On night of 3 December 1984 in Bhopal city of Madhya Pradesh At Union carbide India Ltd, which manufacture carbonate pesticides using methyl isocyanate (MIC). Due to failure of coolant, the reactor got exploded & 40 tons of MIC leaked over 40 sq.km area.***Nature of MIC***: It is a toxic gas, affects lungs, eyes & causes irritation in skin. Remove oxygen from lungs & cause death.

Effects in Bhopal:

About 5000 persons died, 1000 became blind, 65,000 people suffered from eye,respiratory, neuromuscular problems.

- ✓ **Chernobyl Nuclear Disaster:(Nuclear Pollution):**

In April 26 1986, melt down of the Chernobyl nuclear reactor in Ukraine, Russia, has leaked out the radioactive rays & radioactive materials. This was happened due to poor reactor design & human error.

Effects:

about 2000 persons died, more suffered due to degeneration of cells, severe bleeding, anaemia,
skin cancer, animals plants was also affected more.

- ✓ ***Nuclear holocaust in Japan:***
  - In 1945 two nuclear atom bombs were dropped on Hiroshima & Nagasaki cities in Japan.
  - This explosion emitted neutrons, gamma radiations, strontium (Sr*90)
  - This Sr90 has the property of replacing calcium in the bones & so many people were affected by bone deformities. 1,00,000 people were killed,

Effects of nuclear holocaust:

- Nuclear winter [Black soot formed will absorb all UV-radiations & prevent UV radiation to reach the earth.
- This result in cooling effect & water evaporation will also reduce.
- This process opposite to global warming is called nuclear winter.
- Ignition of all combustible material, destroy all living beings, material crushing, destruction of homes

Control Measures

- ✓ Suitable precautions to avoid accident
- ✓ Constant monitoring of the radiation level
- ✓ Checks and control measures done by Atomic Energy Regulatory Board.

Video Content / Details of website for further learning (if any):
https://www.youtube.com/watch?v=I6BUc31cxOM

Important Books/Journals for further learning including the page nos.: - Environmental Science and Engineering by Dr. A. Ravikrishnan, PageNo.6.38 to 6.37

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LECTURE HANDOUTS

Chemistry

I / II

Course Name with Code : **Environmental science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **IV - Social Issues and the Environment** **Date of Lecture:**

Topic of Lecture: Environmental Protection Act.

Introduction :

'**Environment**' refers to all aspects of the natural **environment**, including land, air, water, flora and fauna, as well as the human **environment** (both Indigenous and non-Indigenous cultural and built heritage). ... Some laws are relevant to nearly all areas of **environmental** protection.

Prerequisite knowledge for Complete understanding and learning of Topic:

(Max. Four important topics)

- Environmental problems
- Pollution
- Types of pollution
- Important of natural resources

Detailed content of the Lecture:

Environment Act 1986:

It is a general legislation law to rectify the gaps & laps in above acts. This act empowers the Central Govt. to fix the standard of quality of air, water, soil & noise.

Objectives:

- ✓ To protect & improvement of the environment
- ✓ To prevent hazards to all living creatures & property
- ✓ To maintain peaceful relationship between humans & their environment

Important Features of Environment Act:

- ✓ Empowers safeguard measures to Prevent accidents which cause pollution.
- ✓ Gives remedial measures if accident occurs.
- ✓ The Govt. has authority to close or prohibit or regulate any industry & its operation
- ✓ One who violates the act will be punishable with fine upto one lakh

- ✓ If the violation continues, an additional fine of Rs. 5000/- per day is imposed
- ✓ The act empowers the officers of Central Governtment to inspect the site / plant / machinery for
- ✓ preventing pollution.
- ✓ Collects samples of air, water, soil or other material from any factory / its premises for testing.

WATER ACT 1974:

- ✓ This act provides for maintaining & restoring the source of water
- ✓ Provides for preventing & controlling water pollution.

Objectives:

- ✓ To protect water from all kinds of pollution
- ✓ To preserve the quality of water
- ✓ Establishment of Central & State Boards for preventing water pollution
- ✓ Restrain any person for discharging sewage/effluent into any water body
- ✓ Any contravention of the standards leads to prison for 3 to 6 months
- ✓ Requires permission to set up an industry which discharges effluent

State pollution Control Board:

- ✓ •Take step to establish any industry, disposal system, extension/addition in industry, discharge of effluent into river.
- ✓ Use any new / altered outlet for discharge of sewage
- ✓ Begin to make any new discharge of sewage.

Punishment:

- ✓ Stoppage of supply of electricity, water / any other services
- ✓ Imprisonment for 1½ years to 6 years & Rs. 5000/- fine.

AIR ACT 1981:

- ✓ Enacted in the Conference held at Stockholm in 1972.
- ✓ Deals with problems related to air pollution, quality of air etc.

Objectives of air act:

- ✓ To prevent, control & abatement of air pollution
- ✓ To maintain the quality of air

Important features of air pollution:

- ✓ The Central Board settle disputes between state boards, provide technical assistance & guidance to State board.
- ✓ The State Board verify the emissions of air pollutants from industrial / automobile units
- ✓ The State Board Collect information about air pollution
- ✓ SB examine the standards of manufacturing process & control equipment

- ✓ SB can advise State Government to declare the heavily polluted areas & advice to avoid burning of waste products.
- ✓ Operation of industrial unit is prohibited in a heavily polluted areas
- ✓ Violation of law is punishable with imprisonment & Fine

FOREST ACT 1980:

- ✓ Provides conservation of forests & related aspects.
- ✓ Arrest deforestation

Objectives:

- ✓ To protect & conserve the forest
- ✓ To ensure judicious use of forest products

Important Features of Forest Act:

- ✓ Forests are not diverted without the prior permission of the Central Government
- ✓ Land registered for forest may not be used for non-forest purposes
- ✓ Any illegal activity in a forest area can be stopped immediately
- ✓ Clearance of forest land for re-afforestation is forbidden
- ✓ One who violates the forest law is punishable.

Video Content / Details of website for further learning (if any):

https://www.youtube.com/watch?v=o-WpeyGlV9Y

Important Books/Journals for further learning including the page nos.: - Environmental Science and Engineering by Dr. A. Ravikrishnan, PageNo.6.43to 6.49.

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **IV - Social Issues and the Environment** **Date of Lecture:**

Topic of Lecture: Public Awareness, **Nongovernmental organization (NGO's)**

Introduction :

NGOs are voluntary organization s (VOs). These are popularly known as **NGOs** because they are free from governmental control in their functioning. They are democratic and open to all those wishing to become member of the organization voluntarily and serve the society.

Public awareness is the **public's** level of understanding about the importance and implications of women's and girls' safety in cities and communities. ... First, there is general **public awareness**, which involves widespread understanding and acknowledgement of the issues on a societal level.

Prerequisite knowledge for Complete understanding and learning of Topic:
(Max. Four important topics)

- **Environmental problems**
- **Land degradation**
- **Disaster management**

Nongovernmental organization (NGO's)

- It is nongovernmental organization.
- It is protect and improvement of the environment.

Role of NGO's in India

- ✓ **Mahila Mandals -** Create awareness about women education.
- ✓ **Centre for Science & Environment (CSE) –** permissible limits of pesticides in cola drinks.
- ✓ **World Wide Fund for nature (WWF) –** Environment protection and health.
- ✓ **Centre for Public Interest Litigation**- Human Rights Politics
- ✓ **Child In Need Institute** -Children Education
- ✓ **Child Rights and You (CRY)**- Children Human Rights
- ✓ **Childline India** -Children Human Rights

PUBLIC AWARENESS

Our environment is presently degrading due to many activities like pollution, deforestation, overgrazing, rapid industrialization and urbanization.

Objectives of public awareness:

- Create awareness among people of rural and city about ecological imbalances, local environment,technological development and various development plants.
- To organize meetings, group discussion on development, tree plantation programmes exhibitions.
- To learn to live simple and eco-friendlily manner.

Methods to create environmental awareness:

- In schools and colleges
- Through mass – media
- Cinema
- Newspapers
- Audio - Visual media
- Voluntary organizations
- Traditional techniques
- Arranging competitions
- Leaders appeal
- Non – government organizations.

Video Content / Details of website for further learning (if any);
https://www.youtube.com/watch?v=w_7H4ujbXoY

Important Books/Journals for further learning including the page nos.: - Environmental Science and Engineering by Dr. A. Ravikrishnan, PageNo.6.54 to6.57

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : **Environmental science and Engineering / 19BSS12**

Course Faculty : **Dr.S.Anand**

Unit : **IV - Social Issues and the Environment** **Date of Lecture:**

Topic of Lecture: Augmented topic Environmental Ethics

Introduction :

It means that efforts must be taken to protect an environment and to maintain its stability from the hazardous chemical pollutants. The sun heats the earth; solar radiation passes through the atmosphere, and is absorbed at the earth's surface. It's similar to the warming effect observed in the horticultural made of glass.

Prerequisite knowledge for Complete understanding and learning of Topic:

- ✓ Environmental uses
- ✓ Environmental problems
- ✓ Green house gases

Detailed content of the Lecture:

Environmental Ethics:

Environmental ethics refers to the issues, principles and guidelines relating to human interactions with their environment.

Function of Environment :

- ✓ A life supporting medium for all organisms
- ✓ It provides food, air, water, & other natural resources urbanisation
- ✓ Moderates the climatic conditions smoke
- ✓ Disintegrates the waste discharged by the society
- ✓ Healthy economy depends on healthy environment.

Environmental problems:

- ✓ Deforestation
- ✓ Land degradation.
- ✓ Pollution due to effluent and
- ✓ Water scarcity

- ✓ Population growth &

Solutions to environmental problems:

- ✓ Reducing the energy sources & waste production
- ✓ Recycle and reuse of waste products
- ✓ Soil degradation must be minimized
- ✓ Sustainable development by conservation on resources
- ✓ Over-exploitation of natural resources must be reduced
- ✓ Protection of Bio – diversity
- ✓ Reducing the population & increase the economic growth.

Ethical Guideline

- Love & honour the earth
- Should be grateful to plants & animals
- Should not waste your resources
- Should not steal from future generation
- Should not pollute & hold other living things
- Should not consume more materials
- Should share the precious earth resources

Video Content / Details of website for further learning (if any): https://www.youtube.com/watch?v=-Wa8ICECr3w

Important Books/Journals for further learning including the page nos.: - Environmental Science and Engineering by Dr. A. Ravikrishnan, PageNo.6.18 to 6.21

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental science and Engineering / 19BSS12

Course Teacher : Dr.S.Anand

Unit : V - Human Population and the Environment **Date of Lecture:**

Topic of Lecture: Population Growth Variation among the Nation

Introduction :

Definition: Total number of individuals of the same species occupying a particular Geographical area at a given time.

Population density : It is expressed as the number of individuals of the population per unit area or unit volume

Population dynamics : It deals with the trends of growth of population with time

Population Explosion: The sudden increase in population excessive rate due to high birth rate and low death rate.

Natality **:** which encompasses the production of new individuals by germination

Prerequisite knowledge for Complete understanding and learning of Topic:

(Max. Four important topics)

(i) Environment

(ii) Environmental Science

(iii) Environmental Engineering

(iv) Environmental Education

Detailed content of the Lecture:

Causes of Rapid population growth

- ✓ The death rate is decreases and increase in birth rate
- ✓ The availability of medicine, increased food production, clean water , air decreases the famine related deaths and infant mortality
- ✓ In agriculture based countries children are required to help in the fields that is why

population increases in the developing countries

Characteristics of Population Growth

- ✓ Exponential growth
- ✓ Doubling time
- ✓ Infant mortality rate
- ✓ Total fertility rates
- ✓ Replacement level
- ✓ Male-Female ratio
- ✓ Demographic transition

variation of population among nations

Age structure of population can be classified into three classes:

- ✓ Pre-productive population. (0 - 14 years)
- ✓ Re-productive population. (15 - 44 years)
- ✓ Post re-productive population. (above 45 years)

POPULATION PYRAMIDS

There are many different ways to graphically present population data. The use of a population pyramid is considered the best way to graphically illustrate the age and sex distribution of a given population.

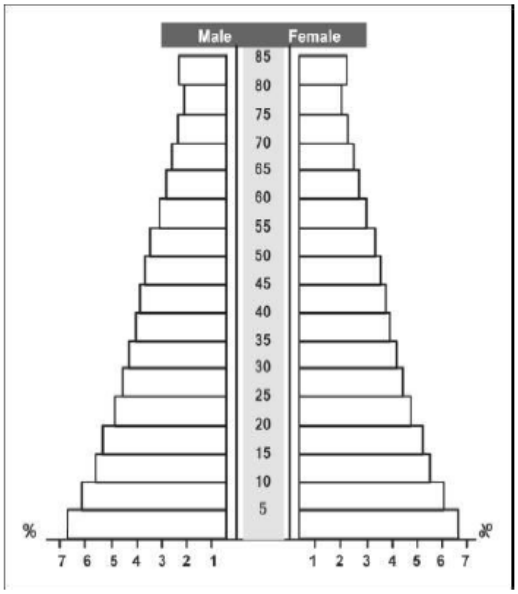
There are generally three types of population pyramids created from age-sex distributions,

a) Expansive population pyramids
b) Constrictive population pyramids
c) Stationary population pyramids

(a) Expansive population pyramids (Pyramid shaped population)

It shows larger numbers or percentages of the population in the younger age groups. The bottom of the pyramid is more which shows that pre-productive age group population is more. The top of the pyramid is less and it shows that the post-productive age group is less These types of pyramids are usually found in populations with very large fertility rates which shows an increased population.

Example: India, Nigeria etc.,

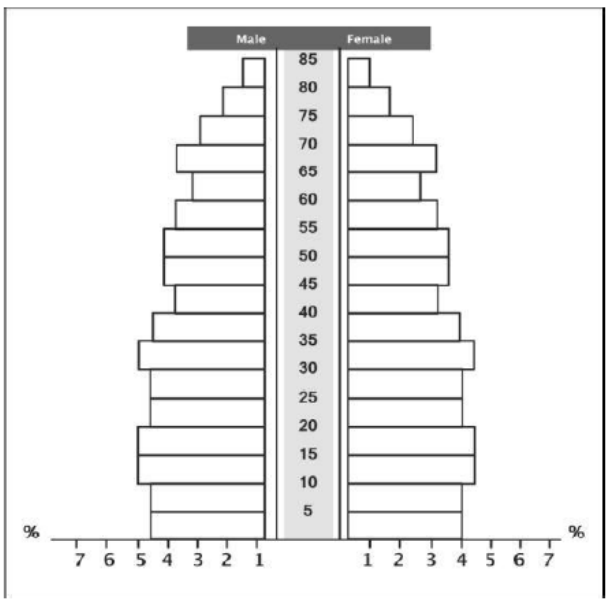


Expansive population of Pyramids

(b) Constrictive population pyramids (Bell shaped population)

The people entering into the reproductive age group will not change the population. Hence the population is stable. The age-sex distributions of the United States and Pennsylvania fall into this type of pyramid.

Examples: France, Canada etc.,

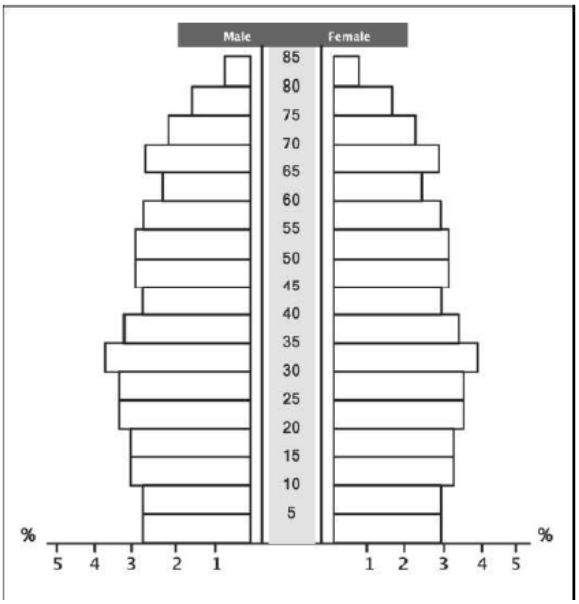


Constrictive (or) Bell shaped Pyramids

(c) Stationary population pyramids (Urn shaped population)

It displays somewhat equal numbers or percentages for almost all age groups. The pre-productive age group is smaller than reproductive age which shows a decrease in the future

population growth. The age-sex distributions of some European countries, especially Scandinavian ones, will tend to fall into this category.



Stationary (or) Urn Shaped Pyramids

Video Content / Details of website for further learning (if any):
https://www.youtube.com/watch?v=HZzOxAR8KSI

Important Books/Journals for further learning including the page nos.:
Environmental Science and Engineering by Dr. A. Ravikrishnan, P. No. 7.2 to 7.8

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental science and Engineering / 19BSS12

Course Teacher : Dr.S.Anand

Unit : V - Human Population and the Environment

Date of Lecture:

Topic of Lecture: Population Explosion

Introduction :

Population Explosion: The sudden increase in population excessive rate due to high birth rate and low death rate. India is in the verge of population which causes poverty

Doubling time: It is the time required for a population to double its size at a constant annual rate. Td (doubling time) = 70/r; r = annual growth rate.

population equilibrium: A state of balance between birth rate and death rate in a population.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Importance of human welfare measures

(ii) Understand role of various government and non government organisation

(iii) Basic knowledge about human population on the enivornment

Causes of population explosion

- ✓ High birth rate (natality) and low death(mortality) rate
- ✓ Low life expectancies
- ✓ Advances in public health
- ✓ Illiteracy
- ✓ Rate of population change for a specific area which is affected by the movement of people into other areas is called Migration.
- ✓ If the movement of people within local area is called Immigration.
- ✓ If the movement of people from original population of new areas is called Emigration
- ✓ High growth rate
- ✓ Decline in death rate
- ✓ Improved medical facilities and public health services

- ✓ Rapid means of transport and communication have facilitated rapid movement of food-grains from surplus areas to deficit areas
- ✓ Control measures on epidemics, drought or famine
- ✓ Decrease in infant mortality

Harmful Effects Of Rapid Population Explosion

- ✓ Food problems
- ✓ Limited Lands, hence increase in population decreases per capita land area for agricultural operations
- ✓ Increase in unemployment
- ✓ Difficulty in capital formation resulted in decrease of savings
- ✓ Failures in Five-Year Plans
- ✓ Set targets are never achieved
- ✓ Decrease in National economy

Effects of population explosion

The effect of population explosion is numerous with far reaching consequences. Some of them are enumerated as under.

- ✓ Unemployment,
- ✓ Low living standard of people,
- ✓ Hindrance in the process of development of economy
- ✓ Pressure on agriculture land,
- ✓ Low per capital income,
- ✓ Lack of basic amenities like water supply and sanitation, education, health, etc.,
- ✓ High crime rate
- ✓ Environmental damage,
- ✓ Migration to urban area in search of job,
- ✓ Energy crisis,
- ✓ Overcrowding of cities leading to development of slums

Population explosion in Indian context

The population explosion, though a worldwide phenomenon, poses a serious threat to India as it has to maintain 16.9% of world's population on only 2.4%of the world's area. The present growth rate of 1.7% is much higher than the world population growth rate of 1.3%, which is of great concern. In order to overcome this problem of population explosion, a sound Population Policy is required with the following objectives.

- ✓ Quick economic development and rising the per capital income.
- ✓ Significant reduction in birth rate, which is more fundamental and important than the first, by providing legal and fiscal motivations like raising age of marriage, legalization abortion etc.

- ✓ The planning of population must not aim merely at controlling the rate of multiplication but it should also include the improvement of the quality of the population as well by providing better facilities in education, health, etc.
- ✓ The death rate should be brought down further, as high death rate results in waste of human energy and resources.

Video Content / Details of website for further learning (if any):
https://www.youtube.com/watch?v=dTaaWUJcza0

Important Books/Journals for further learning including the page nos.:
Environmental Science and Engineering by Dr. A. Ravikrishnan, P. No. 7.8 to 7.11

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental science and Engineering / 19BSS12

Course Teacher : Dr.S.Anand

Unit : V - Human Population and the Environment

Date of Lecture:

Topic of Lecture: Environment human health and human rights

Introduction :

Human Rights: They are the fundamental rights which are possessed by all human beings irrespective of their caste, nationality, sex and language.

Main declarations of universal Human rights: Right to freedom, Freedom of religion, Right to culture and education, Right to equality.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Importance of human health

(ii) Basic knowledge about human Rights

(iii) To understand and known about Important Articles On Human Rights

(iv) Study about the Indian Constitution

Detailed content of the Lecture:

Human Rights are the fundamental rights of Human beings. Dr. Ambedkhar is the prime architec our Indian constitution. "**A right is not something that somebody gives you but it is something that nobody can take away**".

IMPORTANT ARTICLES

All persons are born free and equal, because they have reason and conscience.

i. Everyone has a right to life, liberty and security.

ii. Everyone should be protected from any kind of discrimination.

iii. Everyone has a right to have a nationality and change one's nationality.

iv. Everyone has a right to have education.

v. Everyone has a right to get a job.

vi. Everyone has a right to vote and take part in the government of one's own country.

vii. Everyone has a right to take part in cultural life

viii. No person may be tortured or treated in a cruel or unkind way.

ix. Everyone has the right to seek and gain asylum from persecution.

x. Everyone has a right to have ideas or opinions, to decide what is right and what is wrong and to ch a religion.

xi. Everyone has a right to speak or write freely.

xii. Everyone has a rights to security if suffering unemployment, disease, disability, old age or loss of a partner.

xiii. Everyone has duties to the community where one's personality can be developed freely.

xiv. No one can abuse the rights to destroy the freedom or rights in this Declaration.

IMPORTANT ARTICLES ON HUMAN RIGHTS

Article 1 : All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood.

Article 2 : Everyone is entitled to all the rights and freedoms set forth in this Declaration, without distinction of any kind, such as race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status.

Article 3 : Everyone has the right to life, liberty and security of person. Population explosion affects the environment seriously. Discuss. (8) (N/D2015).

Indian Constitution:

Article 14: It provides for equality before law

Article 15: It prohibits discrimination on the grounds of race, religion, caste, sex etc.,,

Article 16: It provides for equal opportunities for all citizens in matters related to the employment.

Article 19: It provides for freedom for speech and expressions, forming associations and unions and so on.

Article 20: It provides for protection from conviction except in accordance with law of the land.

Article 22: It lays down the rights of a person in custody**.**

Article 23: It prohibits traffic in human beings and all other forms of forced labour.

Article 24: It prohibits the explosion of labour children

Article 25: It guarantees freedom to profess, practice and propagate a religion of one choice.

Article 26: It authorizes the right to establish and maintain charitable and religious institutions.

Article 27: It prohibits compulsion to pay any tax meant for promotion of any religion etc.,

Article 28: It guarantees the secular character of instruction in educational institutions.

Article 29: It guarantees to the minorities the right conserve their language

Article 30: It guarantees the right of linguistic minority and religions to establish and administer Educational institutions.

Article 32: It provides for right to the constitutional remedies for the enforcement of fundamental

Right by appropriate proceeding in the supreme court of india.

Consistent with these provisions, the Central and State governments have framed a number of laws to preserve and safeguard basic human rights. Government of India has set up national institutions

- ✓ National commissions of for scheduled castes and scheduled tribes
- ✓ National commissions for women
- ✓ Minority Commissions

Human health: Generally a physically fit person, not suffering from any disease called a healthy Person.

Factor influencing: Human health influenced by

- ✓ Nutritional factors
- ✓ Biological factors
- ✓ Chemical factors
- ✓ Psychological factors

Important Hazards and Health effects:

Physical: Radioactive radiations, UV, Global warming It cause to the affects the cells in the body, and the function of glands and organs induce the skin cancer.

Chemical: A large number of chemicals are introduced in the environment by anthropogenic activities.

Biological: Bacteria, viruses and parasities to affect health diarrhea, malaria, parasitic worms, anaemia

Preventive measures

- ✓ Always wash your hands before sitting for food
- ✓ Cut short and clean your nails systematically
- ✓ Maintaining the skin, teeth, hair of your body
- ✓ Drinking chemically treated and filtered water
- ✓ Eat food always while it is in hot condition

Video Content / Details of website for further learning (if any):
https://www.youtube.com/watch?v=wV4b6iX0Ew4

Important Books/Journals for further learning including the page nos.:
Environmental Science and Engineering by Dr. A. Ravikrishnan, P. No. 7.14 to 7.20

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental science and Engineering / 19BSS12

Course Teacher : Dr.S.Anand

Unit : V - Human Population and the Environment

Date of Lecture:

Topic of Lecture: Family welfare programme

Introduction :

Family welfare programme was implemented by the government of india as voluntary programme. It is an integral part of overall national policy of growth covering human health maternity, family welfare, child welfare and women's right.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Importance of Family welfare programme

(ii) To learn about the advantage of Family welfare programme

(iii) Basic knowledge about the family planning programmes

(iv) To known about the objective of family planning programmes

Objectives of family welfare programme:

- ✓ Slowing down the population explosion by reducing the fertility
- ✓ Pressure on the environment, due to the overexploitation of natural resources is reduced.

Population stabilization radio:

The radio is derived by dividing crude birth rate by crude death rate.

Developed countries: The stabilization radio of the developed countries is 1, which is more or less stabiliz indicating the population growth

Developing countries: The stabilization radio of the developed countries is 3, which is expected to lower

down by 2025.

Advantages of family welfare programmes

- Reproductive Health and Responsible Parenthood
- Education/Gender Equality
- Spirituality or Value Formation
- Income Generation/Livelihood/Cooperative

Family planning programme:

It is a programme that works on checking the population explosion. Family planning is directly related to the health and welfare of women and prosperity of nation. Family planning services and educati among women has supported declining fertility rates in southern India and Srilanka.

Objective of Family planning programme:

- ✓ Reduce infant mortality rate to below 30 per 1000 infants
- ✓ Achieve 100% registration of births, deaths, marriage and pregnancy
- ✓ Encourage late marriage and late child –bearing
- ✓ Encourage breast feeding
- ✓ Enables to improve women's health education, employment
- ✓ Making family planning available to all the women.
- ✓ Constrain the spread of AIDS/HIV
- ✓ Prevent and control of communical diseases.
- ✓ Promote vigorously the small family norms.
- ✓ Making school education up to age 14 free and compulsory.

Methods of Family planning

Traditional Methods: It includes some traditions like, taboos and folk medicine.

Modern Method:

Permanent method: Sterilization done by a minor surgery.

- ✓ ***Tabectomy:*** It is female Sterilization done by tying the tubes that carry the ovum to the uterus.
- ✓ **Vasectomy:** It is male Sterilization done by tying the tubes that carry sperm.

Temporary method:

- ✓ **Condoms used by male to prevent sperms**
- ✓ **Copper Ts are small objects and can be placed by doctor in the uterus so that ovum cannot be implanted**

Family planning programme in India:

- ✓ **In 1952, India started the Family planning programme**
- ✓ **In 1970, Indian government force the Family planning campaign all over the country.**
- ✓ **In 1978, the government legally raised the minimum age of marriage for men from 18 to 21years women 15 to 18 years.**
- ✓ **In 1981, census report showed that there was no drop in populations. Since then funding for family planning programmes has been increased.**

Video Content / Details of website for further learning (if any):
https://www.youtube.com/watch?v=iqSQS8Af7Jk

Important Books/Journals for further learning including the page nos.:
Environmental Science and Engineering by Dr. A. Ravikrishnan, P. No. 7.12 to 7.14

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental science and Engineering / 19BSS12

Course Teacher : Dr.S.Anand

Unit : V - Human Population and the Environment

Date of Lecture:

Topic of Lecture: Value Education-HIV/AIDS

Introduction :

Education is nothing but learning, through which knowledge about particular thing can be acquired. With the help of our knowledge and experience, we can identify our values to understand ourselves and our relationship with other, and their environment.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Importance of value education

(ii) To know the concept of value education

(iii) Basic knowledge about the HIV/AIDS

(iv) To know the facts about the HIV/AIDS

(v) To get awareness about the HIV/AIDS

Education is the process of bringing desirable change into the behavior of human beings. It can also be defined as the "process of imparting or acquiring knowledge or habits through instruction or study". Education is nothing but learning about the particular thing through knowledge. We can identify our values and ourselves with the help of knowledge and experience. Value education is very important to make a good society.

Importance of Value Education:

Value Education plays important role on the moral and ethical component of education.

Value Education is important:

To know about various living and non- living organisms and their interaction with environment.

- ✓ To promote good developments in the society.
- ✓ To provide socioeconomic and cultural progress of a country.
- ✓ To increase the attitude of humans towards thinking, behavior and in moral and spiritual

values.

- ✓ To improve the integral growth of human beings.
- ✓ To create attitudes and improvement towards sustainable lifestyle.
- ✓ To increase awareness about our national history, our cultural heritage, constitutional rights, national integration, community development and environment.
- ✓ To create and develop awareness about the values and their significance and role.

Types of Values:

- ✓ Cultural values
- ✓ Individual values
- ✓ Global values
- ✓ Spiritual values
- ✓ Universal values

Cultural Values:

Culture is that which binds groups of people. Cultural values promote problem-solving, reliance on science and technology, democracy, patriotism, charity, freedom, equality and justice, individualism, responsibility and accountability.

Individual values:

Personal Values provide an internal reference for what is good, beneficial, important, useful, beautiful, desirable, constructive, etc., The real value of education, is in moulding good citizens.

Global values :

Global values make our society to understand the importance of nature and its growth. It also provides the importance of preservation of our environment.

Spiritual Values:

Spiritual values bring quality and meaning to life and give a person his identity and character. It imparts self-discipline.

Universal values:

These values give the importance in our everyday life.

HIV/AIDS:

AIDS stands for **Acquired Immuno Deficiency Syndrome** .The disease was caused by the virus called HIV or Human Immunodeficiency Virus. The virus causes severe damage to the immune system. It was originated in non-human primates in Sub-Saharan Africa and was transferred to humans during the late 19th or early 20th century.

A retrovirus, the Human Immunodeficiency Virus (HIV) was identified in 1983 as the pathogen. AIDS is characterized by changes in the population of T-cell lymphocytes that play a key role in the immune defense system.

Cause of Aids:

AIDS is caused by HIV infection. The virus attacks the immune system leaving the individual

susceptible to life-threatening infections and cancers. Common bacteria, yeast, parasites and viruses that usually do not cause serious disease in people with healthy immune systems can turn deadly for AIDS patients.

Symptoms:

- ✓ Persistent fever
- ✓ Fatigue
- ✓ Diarrhoea
- ✓ Loss in weight
- ✓ Low number of T cells in blood

Transmission From Non-Humans To Humans:

HIV-1 is found to transmit from chimpanzees and gorillas to humans and HIV-2 transmit from Sooty Mangabeys to humans. Scientists generally accept that the known strains (or groups) of HIV-1 are most closely related to the simian immunodeficiency viruses (SIVs) endemic in wild apepopulations of West Central African forests.

Transmission of HIV

HIV is found in all the body fluids including saliva, nervous system tissue and spinalfluid, blood, semen, pre-seminal fluid, which is the liquid that comes out before ejaculation, vaginal secretions, tears and breast milk.

- ✓ Only blood, semen and breast milk have been shown to transmit infection to others.
- ✓ By sexual contact.
- ✓ By sharing needles or injections with HIV infected individuals.
- ✓ By transfusion of contaminated blood that contains HIV.
- ✓ Through a pregnant woman to her unborn baby through their shared blood circulation or nursing mother can transmit it to her baby in her breast milk.
- ✓ Through Blood donation.

How HIV is Not Transmitted?

The HIV is not transmitted by

- ✓ Shaking hands, hugging
- ✓ Coughing or sneezing
- ✓ Using a public phone
- ✓ Visiting a hospital
- ✓ Sharing food, eating or drinking utensils
- ✓ Using drinking fountains, toilets or showers, public swimming pools
- ✓ Getting a mosquito or insect bite

Test For Aids:

Enzyme-Linked Immuno Sorbent Assay (ELISA):

This test is usually the first one used to detect infection with HIV. If antibodies to HIV are

present (positive), the test is usually repeated to confirm the diagnosis. If ELISA is negative, other tests are not usually needed. This test has a low chance of having a false result after the first few weeks that a person is infected.

Western blot test:

A confirmatory test for HIV exposure that identifies antibodies to HIV proteins and glycol proteins.

CD4-count test:

A decrease in white blood cell is called CD4-cells.Therefore CD4-Count test is also conducted to know HIV infection.

Nucleic acid-based tests (NAT):

Nucleic-acid-based tests amplify and detect one or more of several target sequences located in specific HIV genes.

Prevention of HIV:

- ✓ Through Health Education.
- ✓ Safe sex measures with use of condoms.
- ✓ Avoid drugs or shared needles or syringes.
- ✓ Avoidance of contact with blood and fluids by wearing protective clothing, masks and goggles etc., helps to prevent transmission.
- ✓ HIV-positive women who wish to become pregnant may need therapy while they are pregnant to prevent transmission to their babies.
- ✓ Avoid breastfeeding to prevent transmitting HIV to their infants through breast milk.
- ✓ Through awareness Programmes.
- ✓ Through counseling.
- ✓ Proper checking of Blood during Blood Donation.

Video Content / Details of website for further learning (if any):

https://www.youtube.com/watch?v=ng22Ucr33aw, https://www.youtube.com/watch?v=f37C0_r7jCs

Important Books/Journals for further learning including the page nos.:

Environmental Science and Engineering by Dr. A. Ravikrishnan, P. No. 7.20 to 7.28

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental science and Engineering / 19BSS12

Course Teacher : Dr.S.Anand

Unit : V - Human Population and the Environment

Date of Lecture:

Topic of Lecture: women and child welfare

Introduction :

The main aim of women welfare is to improve the status of the women by opportunities in education, employment and economic independence.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Importance of women welfare

(ii) To need of women welfare

(iii) To know the various schemes of the various organization towards women welfare

(iv) To known the rights of the child.

(v) To get awareness about the child labour.

Women play an important role in our society. Necessary opportunities should be given to women in education, employment and economic independence for improving their status in the society. Women have direct relationship with their environment more than men.

Generally a woman faces the gender discrimination, devaluation at home, at workplace and in public life. The human rights for women are not maintained in our society.

High number of cases of dowry deaths, rape, domestic violence, criminal offender and mental for more to women.

Social Problem Faced By Indian Women:

Our First Prime Minister, Jawaharlal Nehru said, "You can tell the condition of nation by looking at the status of its women "

The problems generally faced by Indian women are

- ✓ Child marriage
- ✓ Neglect during childhood
- ✓ Gender bias
- ✓ Restriction on widow remarriage
- ✓ Dowry
- ✓ Female abortion
- ✓ Educational qualification

Welfare Schemes For Women:

A number of welfare schemes for women have been undertaken by the Government of India.

The details of such schemes under implementation by Ministry of Women and Child Development are as under:

Rajiv Gandhi National Creche Scheme for the Children of Working Mothers (RGNCS):

It provides day care facilities to the children in the age group 0-6 years from families with monthly income of less than 12000/- and provide services such as supplementary nutrition, pre-school education and emergency health care, etc.,

Central Social Welfare Board (CSWB)

The main women welfare related schemes and programmes being implemented by CSWB are as under:

- ✓ **Family Counseling Centers:** It was introduced in 1983. The centers provide counseling, referral and rehabilitative services to women and children who are victims of atrocities, family maladjustment and social ostracism.
- ✓ **Awareness Generation Programme:** This scheme aims at creating awareness among women and the community at large on rights, status and problems of women in particular and other social concerns.
- ✓ **Condensed courses of education for women:** This scheme caters to the needs of girls/women who could not join mainstream education system or who were drop outs from formal schools. The scheme aims to provide educational opportunities to girls/women above the age of 15 years along with additional inputs of skill development/vocational training.
- ✓ **National Mission For Empowerment Of Women (NMEW)** is an initiative of the Government of India for empowering women holistically It facilitates the process of coordination of all the women's welfare and socio-economic development programmes across Ministries and Departments. NMEW is being implemented in all the 35 States and Union Territories.
- ✓ **Working Women's Hostel (WWH) Scheme** envisages provision of safe and affordable hostel accommodation to working women, single working women, women working at places away from their home-towns and for women being trained for employment..
- ✓ **Support To Training And Employment Programme (STEP)** for Women was launched as a Central Sector Scheme during 1986-87. It aims at making a significant impact on women by upgrading skills for self and wage employment.
- ✓ **Rashtriya Mahila Kosh (RMK)** with a corpus of Rs.100 crore extends micro-finance services to bring about the socio-economic upliftment of poor women. NGOs, Women Federations, Co-operatives, not for profit companies registered under Section 25 of the Companies Act.
- ✓ **Women's Empowerment and Livelihood Programme in Mid-Gangetic Plain (WELP)** also called Priyadarshini is being implemented with assistance of International Fund for Agricultural Development. It aims at holistic empowerment of vulnerable groups of women and adolescent girls in the project area through formation of Women's Self Help Groups (SHGs) and promotion of improved livelihood opportunities.
- ✓ **Indira Gandhi Matritva Sahyog Yojana (IGMSY)** is a Conditional Cash Transfer scheme for pregnant and lactating (P&L) women introduced in the October 2010 providing cash incentives for improved health and nutrition to pregnant and nursing mothers.
- ✓ **Swadhar Greh Scheme:** The Ministry of Women and Child Development had been administering Swadhar scheme since 2001 for Women in difficult circumstances. Under the Scheme, temporary accommodation, maintenance and rehabilitative services are provided to women and girls rendered homeless due to family discord, crime, violence, mental stress, social ostracism.

Environmental Degradation And Women Welfare:

The women in the rural area have more response to bring our environment in safety path. The participation of rural women in environmental awareness programs is very essential. The rural

woman involves in arranging fuel, fodder water for her family and actively involved in sustainable use of common resources.

Public awareness about environment helps social groups and individuals to acquire a basic understanding of environment and its associated problems. Man from the very beginning has utilized environment for his existence. During the passage of civilization his wants have multiplied. But he did not care for the physical and natural environment. Man has exploited nature excessively at the cost of the environment. There is an immediate need to make people aware about environment degradation.

Child Welfare:

Childhood is the most innocent stage in a human life. It is the stage where a child is free from all the tensions, fun-loving, play and learns new things and is the sweetheart of all the family members. This part of life is not available for all children. The innocent child is an earning machine working the entire day in order to satisfy the needs and wants of his/her family. This is called 'Child Labour'. There are various causes and effects of child labour. The biggest challenge in the whole world is Child Labour

Causes Of Child Labour:

Poverty

To meet the demand of money, the children are sent as labour. Although they know it is wrong, they have no other alternative as they need the money.

Parental illiteracy

Illiterate parents do not realize the need for a proper physical, emotional and cognitive development of a child. As they are uneducated, they do not realize the importance of education for their children.

- ✓ Absence of universal compulsory primary education
- ✓ Social apathy and tolerance of child labour
- ✓ Ignorance of parents
- ✓ Ineffective enforcement of the legal provisions
- ✓ Non-availability and non-accessibility to schools
- ✓ Irrelevant and non-attractive school curriculum
- ✓ Employers prefer children as they constitute cheap labour

Overpopulation:

Most of the Asian and African countries are overpopulated. Due to limited resources and more needs, Children are employed in various works.

Unemployment of elders:

The industrialists and factory owners find it profitable to employ children. This is so because they can pay less and extract more work. They will also not create union problem.

Orphans:

Children born out of wedlock, children with no parents and relatives, often do not find anyone to support them. Thus they are forced to work for their own living.

United Nations Convention On The Rights Of The Child:

The Convention spells out the basic human rights to which children everywhere are entitled. These are the right to survival, the right to the development of their full physical and mental potential, the right to protection from influences that are harmful to their development and the right to participation in family, cultural and social life.

The Convention defines a 'child' as a person below the age of 18, unless the laws of a particular country set the legal age for adulthood as younger than 18.

The guiding principles of the Convention are

- ✓ All children should be entitled to basic rights without discrimination.
- ✓ The best interests of the child should be the primary concern of decision-making.
- ✓ Children have the right to life, survival and development.

- ✓ The views of children must be taken into account in matters affecting them.

Child Welfare Programmes

Integrated Child Development Services (ICDS) 1975

It is aimed at enhancing the health, nutrition and learning opportunities of infants, young children (0-6 years) and their mothers.

Creche Scheme for the children of working mothers 2006

Overall development of children, childhood protection, complete immunization, awareness generation among parents on malnutrition, health and education.

Reproductive and Child Health Programme 1951

To provide quality Integrated and sustainable Primary Health Care services to the women in the reproductive age group and young children and special focus on family planning and Immunization.

Pulse Polio Immunization Programme 1995

To eradicate poliomyelitis (polio) in India by vaccinating all children under the age of five years against polio virus.

Kasturba Gandhi Balika Vidyalaya 2004

To ensure access and quality education to the girls of disadvantaged groups of society by setting up residential schools with boarding facilities at elementary level.

Mid-day meal Scheme 1995

Improving the nutritional status of children in classes I – VIII in Government, Local Body and Government aided schools and EGS and AIE centres. Encouraging poor children, belonging to disadvantaged sections, to attend school more regularly and help them concentrate on classroom activities.

Providing nutritional support to children of primary stage in drought-affected areas during summer vacation.

Integrated programme for Street Children 1993

Provisions for shelter, nutrition, health care, sanitation and hygiene, safe drinking water, education and recreational facilities and protection against abuse and exploitation to destitute and neglected street children.

The National Rural Health Mission 2005

Reduction in child and maternal mortality, universal access to public services for food and nutrition , sanitation and hygiene and universal access to public health care services with emphasis on services addressing women's and children's health universal immunization, etc.

UN Conventional on Rights of Child (or) International Law

It formulated a set of information standards and measure to promote and protect well-being of children in our society.

Video Content / Details of website for further learning (if any):

https://www.youtube.com/watch?v=S0V0wD9_LOg

Important Books/Journals for further learning including the page nos.:

Environmental Science and Engineering by Dr. A. Ravikrishnan, P. No. 7.28 to 7.32

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental science and Engineering / 19BSS12

Course Teacher : Dr.S.Anand

Unit : V - Human Population and the Environment

Date of Lecture:

Topic of Lecture: Role of information technology in environment protection

Introduction :

The information technology plays a vital role in the field of environmental education. Information technology means collection, processing storage and dissemination of information. A number of software have been developed to study about the environment.

The interest facilities, information through satellites, world wide web and geographical information systems provide us up-to-date information on various aspects of environment and weather.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Role of information technology in environment

(ii) To known the Remote sensing:

(iii) To known where it's used Remote sensing application in environment

(iv) To known the rights of the child.

(v) To get awareness about the IT

Information Technology is one of the fastest growing recent technologies. Information technology is the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data.

Various software has been developed for environment and health care which is user friendly.

A lot of techniques are used under IT for development and application of computational tools to acquire, store, analyze and visualize satellite data which is used for observation and protection of environment.

Role Of It In Environment:

Remote Sensing and GIS (Geographic Information System) provides data and knowledge concerning the global environment as it is used for mapping and monitoring various natural resources.

Ministry of Environment and Forest (MOEF) and Government of India (GOI) have created an Environment Information System (ENVIS). Different ENVIS centers are set up in different organizations for information collection, storage which work towards boosting the relationship between trade and environment

IT is used for computer based modeling for analysis and prediction.

It enables environmental scientists and researchers around the world to communicate, collaborate and coordinate.

Software for the Environment Education:

Remote sensing:

It is method is used to gather information about an object without actually coming in contact with it.

Application of Remote sensing:

In Agriculture: Remote sensing can provide valuable information for the land and water management.

In forestry: Sustainable forest management requires reliable information on the type, density and extent of forest cover wood volume and biomass, forest fire, pest and disease etc., Remote sensing provides all such information.

In land over: Remote sensing data is converted to map, the spatial resolution plays a role on the scale of mapping.

Water resources: Remote sensing data has been used in many applications related to water resources like water body mapping, ground water targeting, wet land etc.,

Database: It is collection of inter –related data on various subjects.

Application of Data base

- ✓ ***The ministry of Environment and Forest***
  - They are compiling data base on various biotic communities.
  - It is also available for disease like HIV/AIDS, malaria etc.,
- ✓ ***National Management information System (NMIS)***
  - They compiled a data base on R&D projects along with information about research scientist and personal involved
- ✓ ***Environmental information system (ENVIS)***
  - It function in 25 centers all over the country. They generate a network of database in areas like pollution control, clean technologies etc.,

Geographic information system (GIS):

Geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage and present all types of geographical data.

GIS gather digital information on environmental aspects such as water and energy reserves and so on. Geographical Information System (GIS) has proved to be a very effective tool in environmental management.

Even interpretations of polluted zones, degraded lands or diseased cropland can be made on GIS.

Locating suitable areas for industrial growth is now being done using GIS by preparing Zoning Atlas.

GIS serves to check unplanned growth and related environmental problems.

Online Information:

It provides vast quantum of information on different subjects including human health and environment.

The World Wide Web with resources material on every aspect, class-room activities, digital files of photos, power- point lecture presentations, animations, web-exercises and quiz has proved to be extremely useful both for the students and the teachers of environmental studies

Video Content / Details of website for further learning (if any):
https://www.youtube.com/watch?v=MSoPXBfn0WU

Important Books/Journals for further learning including the page nos.:
Environmental Science and Engineering by Dr. A. Ravikrishnan, P. No. 7.34 to 7.38

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental science and Engineering / 19BSS12

Course Teacher : Dr.S.Anand

Unit : V - Human Population and the Environment

Date of Lecture:

Topic of Lecture: Role of information technology in Role of It In Human Health

Introduction :

The information technology plays a vital role in the field of human health. It has changed the human life style completely. Many health organization are turning to package solution of IT for streamlining service oriented work in an effective manner

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Role of information technology in environment

(ii) To known the Remote sensing:

(iii) To known where it's used Remote sensing application in environment

(iv) To known the rights of the child.

(v) To get awareness about the IT

Information technology also plays a key role in human health. It helps the doctors to monitor the health of people of that area.

The information regarding outbreak of epidemic diseases from remote areas can be sent more quickly to the district administration to take corrective measures.

IT can be used for audio, visual and data communications for medical consultation, diagnosis, treatment, nursing and medical education.

IT is used for testing of DNA, creating DNA database and genetic information about population. Medical records and finger prints which are used by investigating agencies to identify missing persons and criminals.

Development of Software:

A number of software has been developed for environment and health studies, which are user friendly.

Database:

Database is the collection of inter-related data on various subjects. In the computer, the information of database is arranged in a systematic manner that is easily manageable and can be very quickly retrieved. Database is also available for diseases like HIV/AIDs, Malaria and Fluorosis etc.,

Environmental Information System (Envis):

The Ministry of Environment and Forests, Government of India has created an information

system called Environmental Information System (ENVIS). With its headquarters in Delhi, it functions in 25 different centers all over the country.

The ENVIS centers work for generating a network of database in areas like pollution control, clean technologies, remote sensing, coastal ecology, biodiversity, western Ghats and eastern environmental management, media related to environment, renewable energy, desertification, mangroves, wildlife, Himalayan ecology, mining etc.,

The health aspects of people working in various hazardous and non-hazardous industries, safety measures etc., can be obtained.

Need for IT in Healthcare:

Following points discuss the need of IT in healthcare :

- ✓ The challenge in the 21st century is a surplus of patient information. The human brain, even a physician's brain, cannot keep up with the exponential growth in medical knowledge that will occur in forthcoming years.
- ✓ The ability of human to memorize things has remained flat, but the medical knowledge that needs to be assimilated is increasing geometrically. Rapid technology advancements and continuous increase in performance/price indexes have made information technology (IT) applicable at all levels in health care organizations and patient management.
- ✓ It is difficult for physicians to keep up with the rapidly changing state of medical knowledge and to understand what these changes mean for the treatment of specific patients. In such situation IT based decision support system could help doctors to learn about new treatments.
- ✓ Health Information Technology (Health IT) allows comprehensive management of medical information and its secure exchange between healthcare consumers and providers.

Information Technology tools in Health care:

- ✓ **Electronic Medical Records (EMR) :**

The EMR provides a clinician with real-time access to patient information, such as patients medical condition, visits to health providers, images and reports of diagnostic procedures, schedule of services, allergies and contact information to caregivers and a complete longitudinal record of care evidence based on decision support tools that can be used to aid clinicians in decision making.

- ✓ **Clinical Decision Support (CDS) :**

CDS encompasses computerized alerts and reminders to care providers and patients, clinical guidelines, condition-focused order sets, patient data reports and summaries, diagnostic support, and other tools that enhance decision making in clinical workflow.

- ✓ **Computerized Physician Order Entry (CPOE) :**

CPOE is used by physicians for ordering medications, orders for x-rays and other diagnostic procedures, referrals, discharges, and transfers. One important higher-level application in CPOE is that providers write orders including prescriptions using computers.

- ✓ **Electronic Prescribing (E-prescribing):**

E-prescribing is the transmission, using electronic media of prescription between a prescriber, dispenser, pharmacy manager, either directly or through an intermediary, including an e-prescribing network.

- ✓ **Health Information Exchange :**

It is the electronic connectivity via internet and other networks that enables health care providers to exchange patient health information.

- ✓ **Personal Health Record (PHR) :**

PHR is an electronic application through which individuals can maintain and manage their health information in a private, secure, and confidential environment.

- ✓ **Remote Monitoring :**

  Remote monitoring is the electronic transmission of health care data either entered directly by a patient (or his/her caregiver) or through a medical device to a clinician's Electronic Health Record (EHR) or Patient's Personal Health Record (PHR).

- ✓ **Telehealth/Telemedicine :**

  Telehealth is the use of telecommunication technologies to deliver health-related services and information that support patient care, administrative activities, health education, health services and information over distances.

- ✓ **Home monitoring of Patients :**

  Due to the institutional healthcare costs escalating worldwide, IT can be applied to home monitoring of patients particularly the chronic sick aged patients

Video Content / Details of website for further learning (if any):
https://www.youtube.com/watch?v=MSoPXBfn0WU

Important Books/Journals for further learning including the page nos.:
Environmental Science and Engineering by Dr. A. Ravikrishnan, P. No. 7.40 to 7.41

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LECTURE HANDOUTS

Chemistry

I/II

Course Name with Code : Environmental science and Engineering / 19BSS12

Course Teacher : Dr.S.Anand

Unit : V - Human Population and the Environment

Date of Lecture:

Topic of Lecture: Augmented topic Population growth china -india

Introduction :

In recent past, "although the budgetary allocations for urban development have risen substantially (with JNNURM project) still these do not compare with the allocation for schemes and interventions for rural India. The per capita expenditure on the urban sector at Rs. 1,566.00 is significantly lower than the per capita expenditure in the rural sector, which is Rs. 7,433.00 for the current plan period" (Steering committee on urbanization, Planning Commission, Government of India, 2011).

However, though the present rural-urban population divides looks heavily biased in favour of rural, is this snapshot view adequate to define the focus of our development planning for future? An exploration into the rural-urban population trends has been undertaken in following sections, based on available secondary information, to look further into future trends.

Prerequisite knowledge for Complete understanding and learning of Topic:

(i) Role of information technology in environment

(ii) To known about the India-china population growth

(iii) To known about Age Composition

(iv) To known about Occupational Structure

Population Growth and Processes of Population Change:

Population growth is determined by the annual growth rate, which is calculated in percent per annum. Like, if there is an increase of two people per 100 people of the population, then the annual growth rate would be 2%.

Population of India

Another important aspect of population study is the change in population. This is largely influenced by three main factors like birth, death, and migration of people in a given year.

- ✓ Birth rate: The number of children born per 1000 people in a year
- ✓ Death rate: The number of people died per 1000 people in a year.

What is most noteworthy here that the birth rate in India is and has always been higher than the death rate, which is a major reason behind population growth.

The third and one of the most important factors of population change is migration. Migration can be internal (between states) and international (between countries). While internal migration does not lead to population change, it does affect the population density in the migrated areas.

Characteristics of the Population of India:

- ✓ **Age Composition**

One of the most important characteristics of the population of India, the age composition determines the country's s social and economic structure. The total population is broadly divided into three age groups-

- ✓ Children- below 15 years
- ✓ Working-age- 15- 59 years
- ✓ Aged (Senior)- 59 years and above

- ✓ **Adolescent population**

This is one of the most important and influential elements of the age composition aspect of the population. Adolescents are people between the age groups of 10-19 years and in our country. Also, about one-fifth of the population comprise adolescent individuals. They are especially relevant to the future growth and are the most significant part of the population of India.

- ✓ **Sex Ratio**

The sex ratio of population is determined by the number of females for every 1000 males. This helps in understanding the equality of males and females in the society, which consequently gives an idea of the nation's culture. India's sex ratio has always been on the lower side, until recently. States like Kerala and Union Territory of Pondicherry have higher sex ratio than the major states.

- ✓ **Literacy Rate**

This is yet another important characteristics of the population because the literacy rate of a country determines its economic structure and growth. Literacy, according to the 2001 Census, is the ability of a person of 7 years and above to read and write in any language. The census states the literacy rate of the population of India is almost 74.04% (2016).

- ✓ **Occupational Structure**

The number of people in a population involved in different economic activities helps assess the growth of the country's economy. The occupational structure is the distribution of the population across different occupations. This is an important element of the population of India. Also, our occupational structure has three broad categories-

- ✓ Primary occupation- agriculture, fishing, mining, animal husbandry, forestry etc.
- ✓ Secondary occupation- manufacturing, building, construction work etc.
- ✓ Tertiary occupation- communication, transportation, administration etc.

India is set to overtake China as the world's most populous country in less than a decade, according to a new United Nations report. China and India currently account for about 37% of the entire global population of roughly 7.7 billion, with China currently home to about 1.4 billion people and India to 1.3 billion. But by 2027, India will have more people than China, according to the UN's 2019 World Population Prospects report released Monday, and by 2050 the gap is expected to have widened even further. Between 2019 and 2050, 55 countries or areas are expected to see their populations decrease by at least 1%," the report said, mostly due to low-levels of fertility and in some cases, high numbers of emigration. "In the largest of these, China, the population is projected to shrink by 31.4 million, or 2.2 per cent. That would put China's population at 1.1 billion, fewer than the 1.5 billion forecast for India. By 2050, the report predicts the planet's entire population will be 9.7 billion people, a staggering rise in just one century. Five years after the founding of the UN in 1950, the global population was a mere 2.6 billion people. The UN compiles the report using demographic trends and relevant patterns in human fertility, mortality and migration. The aim is to provide governments with information as they work towards the UN's 2030 Sustainable Development Goals.

Video Content / Details of website for further learning (if any):
https://www.youtube.com/watch?v=MSoPXBfn0WU,
https://www.researchgate.net/publication/305911108

Important Books/Journals for further learning including the page nos.: Population Trend of India-China, Arun Keshav, J.B.Komaraiah, Electronic copy available at: http://ssrn.com/abstract=2658674

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