Unit-1

Definition:

Solid Waste Disposal and Management:

Garbage arising from human or animal activities, that is abandoned as unwanted and useless is referred as solid waste. Generally, it is generated from industrial, residential and commercial activities in a given area, and may be handled in a variety of ways. However, waste can be categorized based on materials such as paper, plastic, glass, metal and organic waste. Solid waste disposal must be managed systematically to ensure environmental best practices. Solid waste disposal and management is a critical aspect of environmental hygiene and it needs to be incorporated into environmental planning.

Solid waste disposal and management includes planning, administrative, financial, engineering and legal functions. It is typically the job of the generator, subject to local, national and even international authorities.

Introduction:

Solid waste disposal management is usually referred to the process of collecting and treating solid wastes. It provides solutions for recycling items that do not belong to garbage or trash. Solid waste management can be described as how solid waste can be changed and used as a valuable resource.

Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn lead to pollution of the environment. Diseases can be spread by rodents and insects. The tasks of solid waste disposal management are complex technical challenges. They can also pose a wide variety of economic, administrative and social problems that must be changed and solved.

Methods of Solid Waste Disposal and Management:

Here are the methods of solid waste disposal and management:

1) Solid Waste Open Burning
2) Sea dumping process
3) Solid wastes sanitary landfills
4) Incineration method
5) Composting process
6) Disposal by Ploughing into the fields
7) Disposal by hog feeding
8) Salvaging procedure
9) Fermentation/biological digestion

1. Solid Waste Open Burning

Solid waste open burning is not the perfect method in the present scenario.

2. Sea Dumping Process

This sea dumping process can be carried out only in coastal cities. This is very costly procedure and not environment friendly.

3. Solid wastes sanitary landfills

Solid wastes sanitary landfills process is simple, clean and effective. In this procedure, layers are compressed with some mechanical equipment and covered with earth, leveled, and compacted. A deep trench of 3 to 5 m is excavated and micro-organisms act on the organic matter and degrade them.

In this procedure, refuse depth is generally limited to 2m. Facultative bacteria hydrolyze complex organic matter into simpler water soluble organics

4. Incineration method

Incineration method is suitable for combustible refuse. High operation costs and construction are involved in this procedure. This method would be suited in crowded cities where sites for land filling are not available.

It can be used to reduce the volume of solid wastes for land filling.

5. Composting process

Composting process is similar to sanitary land-filling and it is popular in developing countries. Decomposable organic matter is separated and composted in this procedure. Yields are stable end products and good soil conditioners. They can be used as a base for fertilizers.

Two methods have been used in this process:

a)Open Window Composting
b) Mechanical Composting

6. Disposal by Ploughing into the fields

Disposal by ploughing into the fields are not commonly used. These disposals are not environment friendly in general.

7. Disposal by hog feeding

Disposal by hog feeding is not general procedure in India. Garbage disposal into sewers including BOD and TSS increases by 20-30%. Refuse is ground well in grinders and then fed into sewers.

8. Salvaging procedure

Materials such as metal, paper, glass, rags, certain types of plastic and so on can be salvaged, recycled, and reused.

9. Fermentation/biological digestion

Biodegradable wastes are converted to compost and recycling can be done whenever possible. Hazardous wastes can be disposed using suitable methods.

UNIT: 3
BIOENERGY

Bioenergy refers to electricity and gas that is generated from organic matter, known as biomass. This can be anything from plants and timber to agricultural and food waste – and even sewage.

How does biomass generate energy?

When biomass is used as an energy source, it's referred to as 'feedstock'. Feedstocks can be grown specifically for their energy content (an energy crop), or they can be made up of waste products from industries such as agriculture, food processing or timber production.

Dry, combustible feedstocks such as wood pellets are burnt in boilers or furnaces. This in turn boils water and creates steam, which drives a turbine to generate electricity.

Wet feedstocks, like food waste for example, are put into sealed tanks where they rot and produce methane gas (also called biogas). The gas can be captured and burnt to generate electricity. Or it can be injected into the national gas grid and be used for cooking and heating.

Bioenergy is a very flexible energy source. It can be turned up and down quickly to meet demand, making it a great backup for weather-dependent renewable technologies such as wind and solar.

Is bioenergy environmentally friendly and sustainable?

Burning biomass does release carbon dioxide. But, because it releases the same amount of carbon that the organic matter used to produce it absorbed while it grew, it doesn't break the carbon balance of the atmosphere.

In comparison, burning fossil fuels releases carbon dioxide that has been locked away for millions of years, from a time when the earth's atmosphere was very different. This adds more carbon dioxide into our current atmosphere, breaking the carbon balance.

The overall sustainability and environmental benefits of bioenergy can depend on whether waste feedstocks or energy crops are being used.

Waste feedstocks

Waste biomass gives off gases naturally when it rots. If this happens in a place where there's no oxygen, such as food waste buried deep within landfill, it can generate methane which is a much stronger greenhouse gas than carbon dioxide. Instead of allowing methane to vent into the atmosphere, breaking it down in a sealed tank allows it to be captured and burnt.

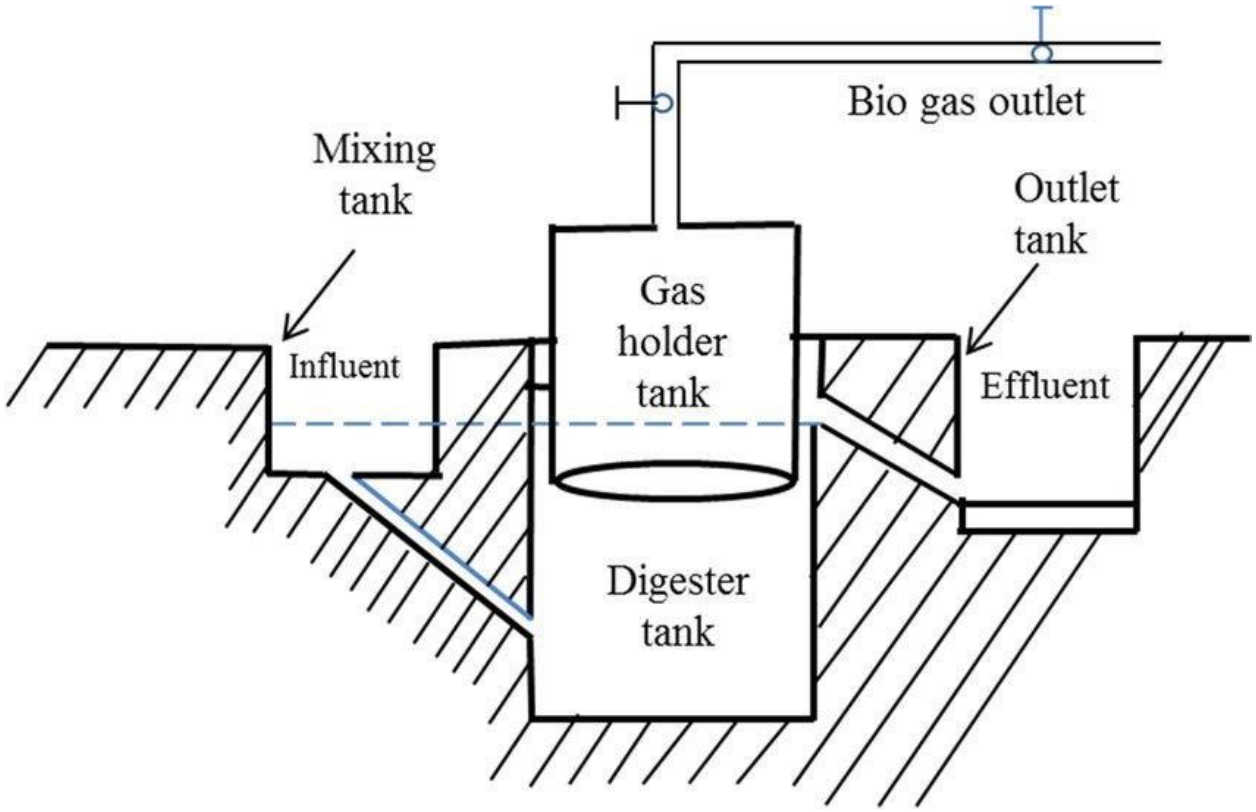
Energy crops

Energy crops are grown specifically for generating energy. However, energy crops can still be low carbon if they are managed sustainably. For example, when energy crops are burnt, equivalent crops should be planted that will absorb the same amount of carbon that was released by burning.

BIOGAS PLANT

A biogas plant is where biogas is produced by fermenting biomass. The substrate used for the production of this methane-containing gas usually consists of energy crops such as corn, or waste materials such as manure or food waste. The fermentation residue left over from the substrates at the end of the process can be used as fertilizer.

The biogas is produced by the microbacterial decomposition of the substrate in an oxygen-free environment, i.e. under anaerobic conditions. To do this, the substrate is pumped into the fermenters. The substrate is stored here under anaerobic conditions and is periodically shifted by agitators to avoid the formation of surface scum and sinking layers. This also allows the biogas to rise more easily. Unlike in the decomposition of biomass under aerobic conditions (for example, composting), under anaerobic conditions the microbacterial organisms can only use a small part of the energy contained. The anaerobically non-usable energy is contained in the "waste product" of biogas in the form of biomethane.



Biogas Plant

Before being fed into the gas grid, this crude biogas from the biogas plant still has to be processed in a processing plant to attain natural gas quality, which means that substances such as carbon dioxide, hydrogen, oxygen and sulfur are filtered out. To do this, it is desulfurized by an iron-containing filter material, or its sulfur content is released by the addition of oxygen. In a final step the gas is dehumidified and can then be used to generate electricity and heat, which is why many biogas plants have combined heat and power units (CHP). The purified biogas can also be fed into the gas grid and transported to points of consumption. A meter measures how much "green gas" was fed in. In this way, besides being piped to industrial customers, biogas can also be made available to bio-CNG dispensers at service stations for natural gas vehicles.

One key differentiator of biogas plants is their mode of operation. Depending on the substrate, the fermentation process is wet or dry. For substrates such as manure with a high liquid content, wet fermentation is always used. Dry or solid-state fermentation is used for stackable organic biomass such as municipal biowaste.

WASTEWATER TREATMENT

Wastewater treatment plants use a combination of physical and biological processes to purify wastewater. These treatment processes are broken down into five major phases:

- **Preliminary treatment**
- **Primary treatment**
- **Secondary treatment**
- **Disinfection treatment**
- **Sludge treatment**

Preliminary Treatment

The preliminary treatment is a physical process of using large bars or screens to remove large pieces of garbage from the incoming wastewater (influent). By removing large trash in this initial step, this phase protects the main sewage system and equipment from potential damage.

Primary Treatment

As wastewater enters the sedimentation tanks (settling tanks) of the primary treatment phase, the flow of water is slowed. This permits heavier solids to settle to the bottom of the tank, while lighter particles float to the top. The settled solids (primary sludge) are pumped to another area for additional processing. The floating materials are skimmed off. The remaining partially-treated wastewater then moves to the next phase in the treatment facility.

Secondary Treatment

The secondary treatment (activated sludge process) is a biological phase. Air is introduced into the wastewater aeration tanks. The air flow stirs the wastewater and sludge, but it is the transfer of oxygen from its gaseous state to a liquid state that actually stimulates the growth of bacteria and other beneficial organisms that naturally exist in the wastewater. By encouraging this bacterial growth, these microorganisms breakdown and consume a large portion of the organic materials. The aerated wastewater moves into final settling tanks, where additional particles

can sink to the bottom (secondary sludge) and be physically removed. The remaining wastewater now passes into the disinfection phase.

Disinfection Treatment

The disinfection treatment introduces chlorine (sodium hypochlorite) into the semi-treated wastewater, for the purpose of killing harmful, disease-causing organisms. Upon completion of this process, the treated wastewater is now referred to as "effluent" and is approved for release into local waterways (streams, rivers, lakes).

Sludge Treatment

This treatment phase combines the primary sludge and secondary sludge, which are concentrated using two additional stages: Thickening and Digestion.

The thickening stage allows further separation of water and solids. The water is reintroduced into earlier stages of the wastewater treatment process. The solids are moved into the "digestion" stage, which involves more time and steps to make it safer for the environment. The digestion tanks are oxygen-free (anaerobic). The sludge is heated to stimulate growth of anaerobic bacteria, which converts the thickened sludge into water, carbon dioxide and methane gas.

NOTE: If fuel cells are installed at the facility, the carbon dioxide and methane gas can be converted into energy (as heat and electricity) and repurposed at the plant or sold.

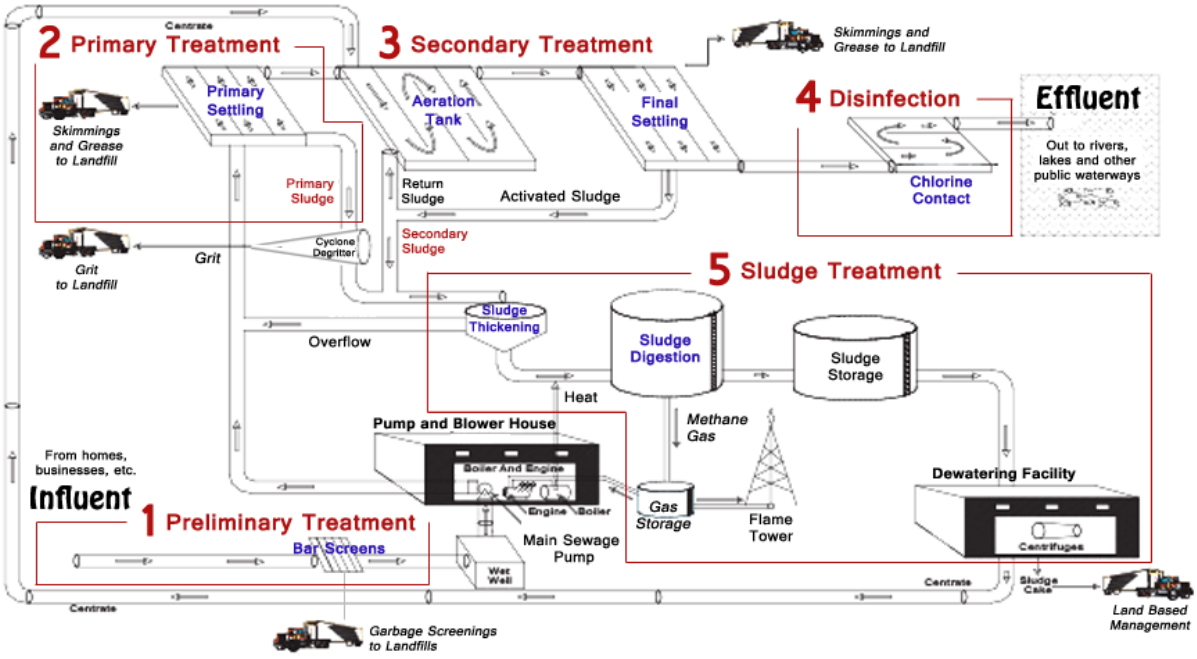


Diagram showing different stages of waste water treatment

Unit-4**What is Green Buildings?**

A green Building uses less energy, water and other natural resources creates less waste & Green House Gases and is healthy for people during living or working inside as compared to a standard Building. Another meaning of Green Structure is clean environment, water and healthy living. Building Green is not about a little more efficiency. It is about creating buildings that optimize on the local ecology, use of local materials and most importantly they are built to cut power, water and material requirements. Thus, if these things are kept in mind, then we will realize that our traditional architecture was in fact, very green. Today, we have forgotten that how to make natural environment, instead copying it from developed countries.

Buildings are a major energy consuming sector in the economy. About 35 to 40% of total energy is used by buildings during construction. The major consumption of Energy in buildings is during construction and later in lighting or air-conditioning systems. This consumption must be minimized. Possibly, this should be limited to about 80-100 watts per sqm.

Introduction

We have heard of climate change. The air is getting warmer - summer comes sooner in most continents including Europe and America. Sea level is rising, - Maldives is sinking. Rivers like the Amazon, the Nile, the Danube, etc, are drying or recede several meters every year. But it's not just happening elsewhere but also happening in India. The glaciers feeding water for the Ganga are melting faster than it should. It means the Ganga could dry up in another about 60 years or so. This would leave over 50 million people thirsty who are living on the banks.

Mangrove forests of Sunderban are the world's most prosperous group of 104 Rainforest Islands. However, it appears that these very unique islands are likely to be wiped out from earth's map very soon or over the period of time. In fact, 15% of Indian side Sunderban and 17% of Bangladesh side of Sunderban Island are already submerged in the ocean. Now the threat of submerging is looming large on Sagardeep, the 4th biggest of the existing island. It is also on this Island, that the annual Mela of Gangasagar is held and visited by Millions of pilgrims every year. This is all because of the generation of Green house gases (GHG) and sea level is rising.

A third of all Carbon Dioxide emissions produced are absorbed in the oceans.

Carbon dioxide dissolved in ocean water becomes a corrosive acid which kills sea life. Thus fish catches are falling. That would leave hundreds of coastal communities hungry.

The coal is burnt in electric power plants, which is a major source of the CO_2generation and it is doing all the damage - melting the glaciers, poisoning the sea, disrupting the monsoon etc. Alternate source of Energy like Renewable energy - from the sun's rays, wind, seas' waves & geo sources - is clean, doesn't release CO_2 and is not hostage to a resource that will die out. In India, we are blessed with a tropical sun, fast winds and thousands of miles of sea coast. Renewable energy is thus the answer for all these ills.

Figure 1: A dump of Waste generated and luing on Streets

Similarly, building Industry is producing second largest amount of Demolition Waste and GHG (almost 40%). Buildings have major environmental impacts over their entire life cycle. Resources such as ground cover, forests, water, and energy are depleted to construct and operate buildings. Resource-intensive materials provide the building envelope and landscaping add beauty to it – in turn using up water and pesticides to maintain it. Energy-consuming systems for lighting, space conditioning and water heating provide comfort to its occupants. Hi-tech controls add intelligence to ‘inanimate' buildings so that they can respond to varying conditions, and intelligently monitor and control resource use, security, and usage of fire systems etc. in the building. Water is another vital resource for the occupants, which gets consumed continuously during building construction and operation. Several building processes and occupant function generate large amount of waste. These all are polluting the environment and increasing (GHG).

Climate Change and Its Effect

Climate is changing fast globally because of increased energy consumption and thus increase Green house gases (GHG) like CO_2. This gives rise to global Warming.

The World produces about 0.6 tones / year / per capita CO_2. India is the 5th largest producing GHG. This impacts the climate change resulting in:

- Water stress and reduction in the availability of fresh water due to potential decline in rainwater.
- Threats to agriculture and food scarcity
- Shifts in area and boundary of different forest and threat to biodiversity with adverse implications for forest dependent activities.

Sea level rising on costal areas and effect on agriculture & habitation.

Green Building Concept and Architecture Planning

To have Green Building Concept, we should look after the following:

1. Optimum use of Energy or power
2. Water conservation
3. Solid and Water Waste management, its treatment and reuse
4. Energy efficient transport systems
5. Efficient Building System Planning etc.

If all Buildings in urban areas were made to adopt green Building concepts, India could save more than 8400 MW of power which is enough to light half of Delhi or 5.5 lakh homes a year according to estimates by TERI. A green building depletes very little of the natural resources during its construction and operation. The aim of a green building design is to minimize the demand on non-renewable resources and maximize the utilization efficiency of these resources when in use and utilization of renewable resources.

Figure 2: A well planned Green Structure

Building Planning should minimize the use of building materials and optimize construction practices and sinks by bio-climatic architectural practices; use minimum energy to power itself for the use of equipment and lighting and air-

conditioning and lastly maximize the use of renewable sources of energy. It should also use efficiently waste and water management practices; and provide comfortable and hygienic indoor working conditions. It is evolved through a design process that requires all concerned –the architect and landscape designer and the air conditioning, electrical, plumbing and energy consultants – to work as a team to address all aspects of building including system planning, design, construction and operation. Thus, enhance the positive impacts on the environment.

Architects & planners should start thinking green in the planning of Buildings. Integrating living & vegetation with architecture is fast gaining popularity around the world and now a new term "Vegitecture" has been coined for it and it is becoming common. Thus the Architect may think to bring concrete jungles to green jungles through "Vegitecture". This is similar to the scenario shown in figure here.

The Architect can use large windows with Double glass system. The glazed trapping will act as insulating layer of air between the two layers of glass. One of these layers of glass filters and disperses light and heat without reflecting it back outside the building. The air conditioning system will also be less intensive because the double glazing system insulates the building. Further, hollow fly ash bricks can be used in walls during construction. This will also provide good insulating properties apart from using waste materials.

Contribution of Concrete towards Green House Gases

Among the primary concrete making materials, the emission of CO_2 is largely attributable to cement production. It is estimated that modern cements contain on an average of about 84% Portland cement clinker and the clinker manufacturing process releases about 0.9 ton of CO_2 per ton of clinker. The Concrete Industry World wide consume more than 3.5 billon tons of cement, so the carbon contribution of this industry is obviously quite large. Thus minimizing concrete consumption through innovative architecture and structural designs is one way to save on the use of cement. Another way is to use smart concrete mixture proportioning approach. This can be done through following approaches:

1. Minimize concrete consumption through innovative architecture and Structural Design methods.
2. Use smart concrete mixture or i-crete as proportioning approach to save on cement in concrete mix.

3. Consume less Cement in concrete / mortar mixtures.
4. Consume less Clinker in Cement making by adding Pozzolana like fly ash or GGBFS in Cement or Concrete.

Characteristics of Green Building

Building construction and its upkeep for livable conditions requires huge energy in lighting, air-conditioning, operation of appliances etc. Green Building i.e. energy efficient building is the one which can reduce energy consumption by at least 40% as compared to conventional building. The cost of constructing energy efficient building is estimated to be 15 – 20% higher as compared to conventional building without energy efficiency. However, this is more than compensated over the period of time i.e during life cycle cost and operation & living. Using green building materials and products, promotes conservation of non renewable resources internationally. In addition, integrating green building materials into building projects can help reduce the environmental impacts associated with the extraction, transport, processing, fabrication, installation, reuse, recycling, and disposal of these building industry source materials.

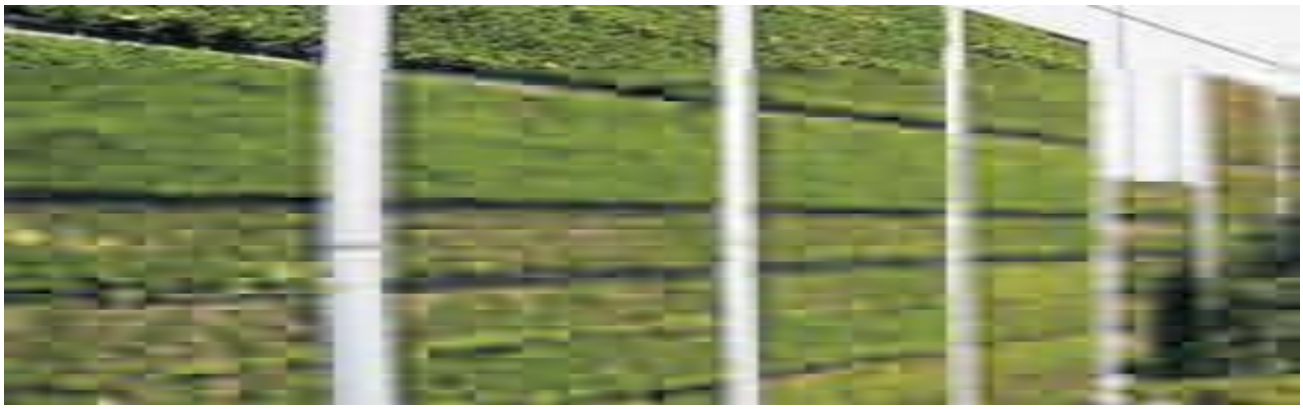
Green Building Products and Materials

Building and Construction activities worldwide consume about 3 billon tons of raw materials each year. Using green building materials and products promotes conservation of dwindling non renewable resources. In addition, integrating green building materials into building projects can help reduce the environmental impacts associated with the excavation, extraction, transport, processing, recycling and disposal of these building industry source materials.

Green building materials are composed of renewable, rather than nonrenewable resources and are environmentally responsible because impacts are considered over the life cycle period.

Depending upon project-specific goals, an assessment of green materials may involve an evaluation of one or more of the following parameters:

a. Resource efficiency
b. Energy efficiency
c. Affordability
d. Possible Recycling of Material and Waste generation
e. Water conservation
f. Effective Indoor air quality



A) Resource Efficiency: It can be accomplished by utilizing materials that meet the following criteria.

Resource efficient manufacturing process: Products manufactured with resource-efficient processes including reducing energy consumption, minimizing waste (recycled, recyclable and or source reduced product packaging) and thus reducing greenhouse gases.

Local availability: Building materials, components and systems found locally or regionally will save energy and resources in transportation to the project site.

Salvaged, refurbished, or remanufactured: It avoids the material from disposal and renovating, repairing, restoring, or generally improving the appearance, performance, quality, functionality or value of a product.

Durable: Materials that are longer lasting or are comparable to conventional products with long life expectancies.

B) Energy Efficiency: It can be maximized by utilizing materials and systems that meet the various criteria that help reduce energy consumption in buildings and facilities as indicated above.

C) Affordability: It can be considered as the cost for the building product when life-cycle costs are comparable to conventional materials or as a whole it is within a project-defined percentage of the overall budget.

Figure 3: A typical Green House

D) Possibility of Recycling of Material and resultant Waste Generation: It should satisfy the following:

Recyclable Content Products with identifiable recycled content and minimum waste generation, including post use content with a preference for post consumer use content should be considered.

Reusable or recyclable Select materials that can be easily dismantled and reused or recycled at the end of their useful life.

E) Water Conservation It can be judged from utilizing the materials and systems that help reduce water consumption in buildings and conserve water in landscaped areas. This is similar to chemical admixture used in concrete to reduce water content.

F) Effective Indoor Air Quality It should enhance by utilizing such material and meet the following criteria:

Low or non-toxic Materials that emit few or no carcinogens, reproductive toxicants or irritants as demonstrated by the manufacturer through appropriate testing.

Minimal chemical emissions Products that have minimal emissions of Volatile Organic Compounds (VOCs). Products that also maximize resource and energy efficiency while reducing chemical emissions.

Low-VOC assembly Materials installed with minimal VOC-producing compounds, or no-VOC mechanical attachment methods with minimal hazards.

Moisture resistant Products and systems that resist moisture or inhibit the growth of biological contaminants in buildings.

Some Steps for Material Selection

Material selection can begin after the establishment of project-specific environmental goals. The environmental assessment process for building material involves three basic steps.

1. Survey
2. Evaluation
3. Selection

1. Survey: This step involves gathering of all technical information about the material which can be identified, including manufacturers' information such as Material Safety Data Sheets (MSDS), Indoor Air Quality (IAQ) test data, product warranties, source material characteristics, recyclable content data, environmental, performance and durability information. In addition, this step may also involve investigating other issues like building codes, government regulations, building industry performance, model green building product specifications etc. Such survey will help in identifying the full range of the project's material options.

2. Evaluation: This step involves confirmation of the technical information, as well as filling in information gaps. For example, the evaluator may request product certifications from manufacturers to help sort out possible exaggerated environmental product claims. Evaluation and assessment is relatively simple when comparing similar types of building materials using the environmental criteria. However, the evaluation process is more complex when comparing different products with the same function. Then it may become necessary to process both descriptive and quantitative forms of data.

A life cycle assessment (LCA) is an evaluation of the relative "greenness" of building materials and products. LCA addresses the impact of a product through all of its life stages. This tool that can be used is the LCA methodology through a software evaluation like BEES (Building for Environmental and Economic Sustainability) software. Such software can easily be developed or otherwise available commercially. It allows users to balance the environmental and economic performance of building products.

3. Selection: This step often involves the use of an evaluation matrix for scoring the project-specific environmental criteria. The total score of each product evaluation will indicate the product with the highest environmental attributes. Individual criteria included in the rating system can be weighted to accommodate project-specific goals and objectives.

Advantages of Green Building Materials

Green building materials offer some or all of the following benefits to the building owner and building occupants:

- Reduced maintenance/ replacement costs over the life of the building
- Energy conservation
- Improved occupant health and productivity
- Life cycle cost savings
- Lower costs associated with changing space configurations.
- Greater design flexibility

Sustainable Development or Sustainable Building Concept

It is a development that meets the needs of present without compromising the needs of future generations to come. The concept of sustainable building incorporates and integrates a variety of strategies during the design, construction and operation of building projects. The use of green building materials and products represents one important strategy in the design of a building. As more than 40% population is living in the cities so these cites should be made Sustainable first.

Waste Generation

Huge amount of waste is generated every day in each city. For example, Delhi alone generates more than 6,500 tons of Garbage every day. By 2020 its amount will reach 1800 tons every day. Such amount of waste disposal is a Herculean task and will need space for dumping and fuel costs for transportation of waste upto disposal areas. In the cities the disposal areas are outside city which are miles apart. Therefore, this waste must be processed at nearby places and reused as much as possible.

Local processing of the waste will not only keep the city clean but also generate energy and resource materials. It will also generate huge employment opportunities and give several other advantages and thus sustainable.

Some Benefits of a Green Building Concept

- Green buildings are designed to be healthier and having more enjoyable working environment. Workplace qualities that improve the environment and which help in developing the knowledge of workers and may also reduce stress and lead to longer lives for multidisciplinary teams.
- Reduced energy and water consumption without sacrificing the comfort level.
- Significantly, better lighting quality including more day lighting, better daylight harvesting and use of shading, greater occupancy control over light levels and less glare.
- Improved thermal comfort and better ventilation.
- Limited waste generation due to recycling process and reuse.
- Increase productivity of workers and machines. It is reported that productivity can be increased by about 25% while following such green house norms.
- Attracting and retaining the best employees, can be linked to the benefits and qualities of workers receive, including the physical, environmental and technological aspects.
- Green building activities result in reduction of operating costs by 25-30%.

Need to Develop A Green Building Policy (GBP) in INDIA

The Green Building movement in India was started in 2003 and received a major impetus when, CII –sohrabji Godrej Green Business Centre Building in Hyderabad became the first green building in India which was awarded with the prestigious and the much covered LEED (Leadership in Energy and Environmental Design) Platinum rating by the US Green Building Council (USGBS) and also became the world's greenest Building in 2003.

LEED India Concept

The Indian Green Building Council (IGBC) Designed and started. The Leadership in Energy and Environmental Design (LEED – India) system is called Green Building Rating System. It is an internationally accepted benchmark for the design, construction and operation of high performance green building.

LEED certified buildings utilize less toxic materials, low-emitting adhesives & sealants, paints, carpets, and composite woods, and indoor chemical & pollutant source control.

What Is To Be Done?

Figure 4: A typical highway with greenery around

Essential to an effective green building policy that delivers energy efficiency is by using simple, standardized and better energy performance materials throughout the construction in all phases of building design and operation. Thus, to have green Building concept, some or all of the following steps need to be followed.

- Plan each office / home's orientation to the sun to harness energy and shield it from heat i.e. Proper Building Orientation and Landscape and emphasis on natural light.
- High efficiency insulated glass windows can reduce requirements of energy during the operation or use of Building. Thus it will emit minimum carbon dioxide CO_2
- Minimize Cement / concrete consumption through innovative architecture and Structural Design for optimum use of cement.
- Maximum use of waste Pozzolanic materiel like fly ash in Concrete Mixture along with Cement.
- Non – toxic paints should be used on the walls. These use water rather than petroleum based solvents and do not emit smog producing pollutants. This will improve Indoor Air Quality.
- Use Sewage treatment and recycle the waste water from bathroom and Kitchen.

- Organic waste, both solid and liquid, produce a large quantity of Methane which is 23 times stronger than CO_2 as green house gases (GHG). Such organic waste must be processed to tap gas which can be used as cooking gas or fuel.
- Provide Rainwater Harvesting systems on the roof of Building to collect water, which can be used to flush Toilets or for general wash or recharge the ground.
- Use Solar Panels to heat bath water and generate little electricity for use when there are power cuts instead of using Invertors.
- Install simple Wind turbines on the roof, which can be used to generate electricity for use when there is no power.
- A rain garden can help reduce storm water runoff.
- Use Drip Irrigation to water the plants or Native landscaping around building. This requires less water for irrigation and maintenance.
- Government or Municipal corporations should provide enough incentives like tax rebates or tax breaks for green buildings during approvals.
- Government should make basic green norms – like gray water recycling and rainwater harvesting compulsory for all new buildings in all 5,161 cities, towns and urban agglomerations in the country.

Conclusion

The poverty alleviation in the developing countries can be effectively achieved by conservation of energy and creation of employment opportunities. The energy saved can be ploughed back for further development which creates a large employment opportunity. The technologies and the materials used for development should complement the use of local and waste resources. The labor forces enhancing their capability and standard of living be used to avoid the widening of gap between haves and have not. Processing of waste must be taken up at a large scale and locally in each of 5,161 cities and towns. This will not only generate jobs but also give out energy & resources of material which can be usefully utilized.

It can be a blessing for the fast developing country like India that the measures called for sustainable development can be the measures of poverty alleviation as well as illustrated in the theme of Seminar through sustainable development and reprocessing of waste.

UNIT: 4

ORGANIC FARMING

Organic farming is a technique, which involves the cultivation of plants and rearing of animals in natural ways. This process involves the use of biological materials, avoiding synthetic substances to maintain soil fertility and ecological balance thereby minimizing pollution and wastage.

In other words, organic farming is a farming method that involves growing and nurturing crops without the use of synthetic based fertilizers and pesticides. Also, no genetically modified organisms are permitted.

It relies on ecologically balanced agricultural principles like crop rotation, green manure, organic waste, biological pest control, mineral and rock additives. Organic farming makes use of pesticides and fertilizers if they are considered natural and avoids the use of various petrochemical fertilizers and pesticides.

International Federation of Organic Agriculture Movements (IFOAM), an international organization established in 1972 for organic farming organizations defines the goal of organic farming as:

"Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved…"

In the conventional farming methods, before seeds are sown, the farmer will have to treat or fumigate his farm using harsh chemicals to exterminate any naturally existing fungicides. He will fertilize the soil using petroleum-based fertilizers. On the flip side, the organic farmer will prepare and enrich his land before sowing by sprinkling natural-based fertilizers such as manure, bone meal or shellfish fertilizer.

Before planting seeds, the conventional farmer will soak the seeds in fungicides and pesticides to keep insects and pests at bay. Chemical are also incorporated in the irrigation water to prevent insects from stealing the planted seeds.

On the other hand, the organic farmer will not soak his seeds in any chemical solution nor irrigate the newly planted seeds using water with added chemicals. In fact, he will not even irrigate with municipal water, which is normally chlorinated to kill any bacteria. He will depend on natural rain or harvest and stored rainwater to use during dry months.

When the seeds have sprung up, and it's time to get rid of weeds, the conventional farmer will use weedicide to exterminate weeds. The organic farmer will not use

such chemicals to get rid of the weed problem. Instead, he will physically weed out the farm, although it's very labor-intensive. Better still, the organic farmer can use a flame weeder to exterminate weeds or use animals to eat away the weeds.

When it comes to consumption, it's a no-brainer that anyone consuming products from the conventional farmer will absorb the pesticide and weedicide residues into the body, which could lead to developing dangerous diseases like cancer. People understand that health is important to them and that's why they are going organic in record numbers today.

Uses of Organic Farming:

1. Protecting soil quality using organic material and encouraging biological activity
2. Indirect provision of crop nutrients using soil microorganisms
3. Nitrogen fixation in soils using legumes
4. Weed and pest control based on methods like crop rotation, biological diversity, natural predators, organic manures and suitable chemical, thermal and biological intervention
5. Rearing of livestock, taking care of housing, nutrition, health, rearing and breeding
6. Care for the larger environment and conservation of natural habitats and wildlife.

Disadvantages of Organic Farming

- Organic farming in India has fewer choices, and off-season crops are limited.
- Organic agricultural products are low in the early years. Farmers find it difficult to accommodate mass production.
- The main disadvantage of organic farming is the lack of marketing of the products and Inadequate infrastructure.

METHODS : Crop Diversity: Now a days a new practice has come into picture which is called -Polyculture- in which a variety of crops can be cultivated simultaneously just to meet the increasing demand of crops. Unlike the ancient practice which was -Monoculture- in which only one type of crop was cultivated in a particular location.

2. Soil Management: After the cultivation of crops, the soil loses its nutrients and its quality depletes. Organic agriculture initiates the use of natural ways to increase the health of soil. It focuses on the use of bacteria that is present in animal waste which helps in making the soil nutrients more productive to enhance the soil.

3. Weed Management: -Weed-, is the unwanted plant that grows in agricultural fields. Organic agriculture pressurizes on lowering the weed rather than removing it completely

.**4. Controlling other organisms:** There are both useful and harmful organisms in the agricultural farm which affect the field. The growth of such organisms needs to be controlled to protect the soil and the crops. This can be done by the use of herbicides and pesticides that contain less chemicals or are natural. Also, proper sanitization of the entire farm should be maintained to control other organisms.

5. Livestock: Organic farming instigates domestic animals use to increase the sustainability of the farm.

6. Genetic Modification: Genetic modification is kept away from this kind of agricultural set up because organic farming focuses on the use of natural ways and discourages engineered animals and plants.