

3. Diversion of water bodies through canals to increase water supply in drier areas.
4. Regular dredging and desiltation of rivers, streams and other water bodies.

Case Study

Israel's Drip Irrigated Farming. The small and arid state of Israel began using drip irrigation systems, as it is short of water. With this technique, Israeli farmers have been able to improve the efficiency of irrigation by 95%. Over a 20 year period, Israel's food production has doubled without an increase in the use of water for agriculture. Today, Israel is one of the major suppliers of fruit and vegetables in the world.

DAMS—Benefits and Problems

Benefits. The dams like Bhakra-Nangal, Hechrakund, Nagarjuna Sagar and Damodar have played a significant role in India's social and economic progress during the past few decades. Without them India would have been a thirsty, hungry and dark land ravaged by floods and droughts every year. Our late Prime Minister Pt. Jawahar Lal Nehru called the dams, 'the temple of modern India', which store precious rain water to irrigate farmland, generate electricity, supply drinking water and save land from floods and droughts.

The various benefits of dams are :

1. Hydroelectricity generation.
2. Ensuring the year-round water supply.
3. Transfer of water from areas of excess to areas of deficit using canals.
4. Flood control and soil protection.
5. Irrigation during dry periods.
6. Multi-purpose river valley projects also provide for inland water navigation, and can be used to develop fish hatcheries and nurseries.

Problems. As argued by environmentalists, big dams submerge forest, displace local people, cause water logging and siltation and may result in earthquakes. It is reported that River valley Projects in countries like India and China displace large number of people because of high population densities of these countries. The relief and rehabilitation programmes offered by the governments have always seemed inadequate. Thousands of people displaced by such projects are yet to be resettled amicably.

Some of the disadvantages/problems of dams are as under:

1. Submergence of large areas of land that might include fertile fields and human settlements.
2. Resettlement and rehabilitation of displaced people.
3. A number of water related diseases casually caused with the creation of reservoirs.
4. The enormous weight of water behind the dam could trigger seismic activity which might crack the dam and unleash a flood of biblical proportions.
5. Some dams lose enormous water through evaporation and seepage into porous rock beds that they waste more water than, what becomes available.
6. Salt left behind by Evaporation increases the salinity of the water and make it unusable when it reaches the downstream cities.
7. Dam projects can also lead to lowered nutritional status when highly productive fields are flooded.

Alternative to fossil fuels: Bio-energy**Biomass**

Biomass is the term used to describe the organic matter produced by photo synthesis that exists on the Earth's surface. The source of all energy in biomass is the Sun, the biomass acting as a kind of chemical energy store.

Biomass resources: They are renewable energy resources. Natural Biomass resources vary in type and content depending upon the geographical location. World's biomass producing areas are classified into three distinctive regions.

- a. Temperate regions: Produce wood, crop residues like straw, vegetable leaves, human and animal waste.
- b. Arid and Semi arid regions: Produce very little excess vegetation for fuel. People living in these areas are often the most affected by desertification and have difficulty in finding sufficient wood fuel.
- c. Humid tropical regions: Produce abundant wood supplies, crop produces, animal and human wastes, commercial industrial agro and food processing residues. Many of the world's poorer countries are found in these regions and hence there is a high incidence of domestic biomass use.

Biomass use in the development world

More than two billion people in the developing world use biomass for the majority of their household energy needs. Biomass is also widely used for non-domestic appliances. Biomass is available in varying quantities through out the developing world. In recent decades, with the threat of global deforestation much focus has been given to the efficient use of biomass.

Traditionally the extraction of energy from biomass is split into three distinct categories:

1. **Solid biomass:** The use of trees, crop residues animal and human waste, house hold or industrial residues for direct combustion to provide heat.
2. **Biogas:** it is obtained an aerobically (without air) digesting the organic material to produce ethane. Animal waste and municipal waste are two common feed stocks for anaerobic digestion.
3. **Liquid bio-fuels:** They are obtained by subjecting organic materials to one of the various chemical or physical processes to produce a usable, combustible liquid fuel. Vegetable oils are the materials to manufacture the Bio fuels.

1. Solid biomass**Activities including Commercial utilization of Solid biomass**

In India, sugar mills are rapidly turning to bagasse, the leftover of cane after it is crushed and its juice extracted to generate electricity. This is mainly done to clean up the environment and cut down power cost. According to current estimates, about 3500 MW of power can be generated from bagasse in the existing 430 sugar mills of the country. The advantages of this biomass can be locally sourced.

Benefits of Solid biomass energy:

- * Renewable or recyclable energy source (Stored solar energy)
- * Less waste directed to landfills.
- * Decrease reliance on imported energy sources.
- * Potential rural development and job creation.
- * can generate renewable electricity when the Sun is not shining and the wind is not blowing.

2. Biogas

Biogas is obtained by an aerobically (without air) digesting organic material to produce a combustible gas known as methane. Animal waste and municipal waste are two common feed stocks for an aerobic digestion.

At present biogas technology provides an alternative source of energy in rural India for cooking. It is particularly useful for village households that have their own cattle. Through a simple process cattle dung is used to provide the gas. The residual dung is used as manure.

India has world's largest cattle population – 400 million, thus offering tremendous potential for biogas plants. Biogas production has the capacity to provide us with about half of our energy needs either burned for electricity production or piped into current gas lines for use. It just has to be done and made a priority.

A sixty cubic feet approx 2 m³ biogas plant can serve the needs of one average family. The charge from the biogas generation consists of dung and waste in the form of slurry. The fermentation is carried out between 35 to 500°C. About 160 liters of gas is produced per kg of cow dung and heating value of the gas is 490 kilocalories on 160 liters basis.

The average composition of biogas is methane 55%. Hydrogen 7.4%, Carbon dioxide 39%, Nitrogen 2.6%, Water- traces. The average gross calorific value of the gas is 5300 kilo cal/cubic meters.

3. Liquid bio-fuels (Energy of future for transportation)

i). Ethanol, ii). Biodiesel, iii). Fuel cells

i. Ethanol

- Ethanol is a fuel made from sugars found in plants.
- Earlier, corn was being turned into an alcohol fuel called Ethanol.
- Nowadays, Ethanol is being used as a clean burning fuel for many vehicles.
- This is used as Gasohol consisting of 90% gasoline + 10% ethanol (reduces air pollution)
- The mixture burns cleanly and has a high octane rating. Most of the ethanol now being used for gasohol is produced from corn grains, the only exception being a small amount of ethanol produced as a by-product in some paper mills.

Advantages

- Ethanol is cleaner than gasoline and does not pollute the air
- Ethanol is non-toxic and is also bio-degradable; it breaks down quickly into harmless substances if it is spilled.
- Made from plants, comes from renewable energy source
- All engines which use gasoline can use Ethanol without making any changes to this engines

ii. Bio-diesel

Biodiesel is a domestically produced, renewable fuel that can be manufactured from vegetable oils and animal fats for use in diesel vehicles. Biodiesel's physical properties are similar to those of petroleum diesel, but it is a cleaner burning alternative. Using biodiesel in place of petroleum diesel reduces emissions.

Advantages

- Biodiesel fuel is a renewable energy source unlike petroleum based diesel.
- Less polluting than petroleum diesel.
- The lack of sulfur in 100% biodiesel extends the life of catalytic converters.

- Biodiesel fuel can also be used in existing oil heating systems and diesel engines without making any alterations.
- It can also be distributed through existing diesel fuel pumps.
- The lubricating property of the biodiesel may lengthen the life time of engines.

Disadvantages

- At present, Biodiesel fuel is about one and half times more expensive than petroleum diesel fuel.
- It requires energy to produce biodiesel fuel from crops, plus there is the energy of sowing, fertilizing and harvestine.
- As Biodiesel cleans the dirt from the engine, this dirt can then get collected in fuel filter, thus blocking it. So, filters have to be changed after the first several hours of biodiesel use.
- Biodiesel fuel distribution infrastructure needs improvement.

iii. Fuel cells

- A fuel cell is device that converts the chemical energy from a fuel into electricity through a chemical reaction with oxygen or another oxidizing agent.
- Hydrogen is the most common fuel, but hydrocarbons such as natural gas and alcohols like methanol are sometimes used.
- Fuel cells are different from batteries in the way they require a constant source of fuel and oxygen to run, but they can produce electricity continually for as long as these inputs are supplied.
- The electricity produced can be used to power cars, buses, laptops and mobile phones.

Structure

- Fuel cells consists of 2 electrodes, a negative anode and positive cathode
- Electrodes are separated by a solid or liquid electrolyte
- Electrically charged particles move between the 2 electrodes
- Catalyst are often used to speed up the reactions at the electrodes
- Electricity is generated when oxygen and hydrogen combine to form water

Advantages

- The fuel cell produces no greenhouse gases or other air pollutants.
- High efficiency conversion: Fuel cells convert chemical energy directly into electricity without the combustion process.
- Quiet operation: The nature of operation is extremely quiet in operation. This allows fuel cells to be used in residential or built up areas where the noise pollution is undesirable.
- Safer than gasoline

Disadvantages

- Storage and distribution of the hydrogen fuel. Hydrogen gas is difficult to contain and most methods add considerable weight to a vehicle.
- The operation of cells in very cold weather is a problem, since water is always present in and around the cell.
- Transporting and dispensing the gas will also require new methods.
- Presently the cost of fuel cells is not competitive.

Environmental impact assessment

The environmental effects are normally defined through the term environmental impacts which may be caused or induced by set of human action or nature itself. The impacts of the environment are assessed through Environmental impact assessment or environmental impact analysis.

Environmental impact assessment is defined as an activity designed to identify and predict the impact of legislative proposals, policies, programmes, projects and operational procedures on the biogeophysical environment and on the health and well being of human beings and to interpret and communicate information about the impact.

Purpose of the EIA process

The environmental impact assessment (EIA) process is an interdisciplinary and multistep procedure to ensure that environmental considerations are included in decisions regarding projects that may impact the environment.

The EIA document itself is a technical tool that identifies, predicts, and analyzes impacts on the physical environment, as well as social, cultural, and health impacts.

The EIA focuses on problems, conflicts or natural resource constraints that could affect the viability of a project. After predicting the effects, an EIA identifies remedies to minimize the problems and outlines ways to improve the projects suitability for its proposed environment.

Who prepares an EIA?

Depending on the EIA system, responsibility for producing an EIA will be assigned to one of two parties: (1) the government agency or ministry, or (2) the project supporter. If EIA laws permit, either party may opt to hire a consultant to prepare the EIA or handle specific portions of the EIA process, such as public participation or technical studies.

The major objective or goals of EIA are

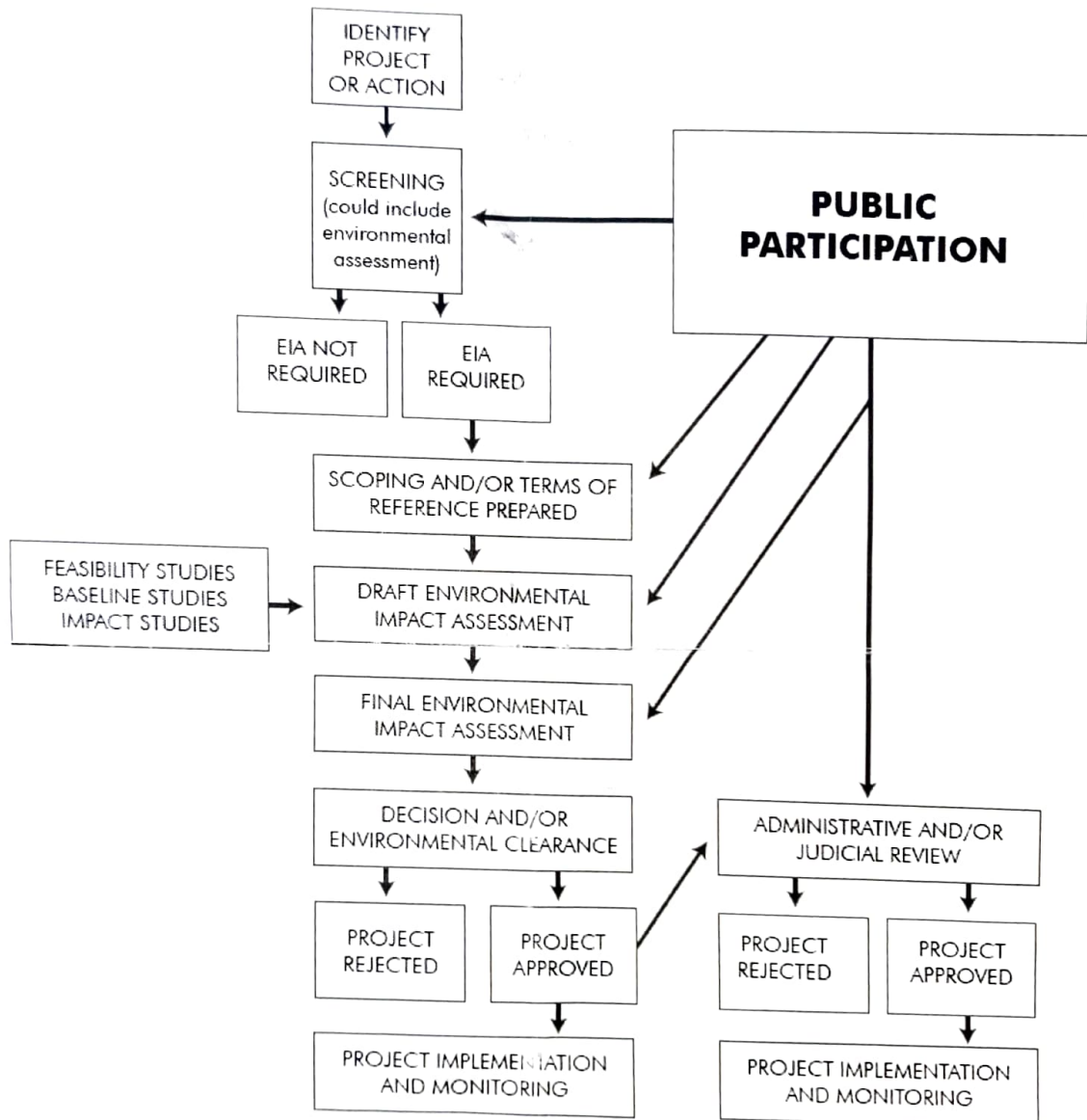
- a) Resource conservation
- b) Waste minimization
- c) Use efficient equipment
- d) Recovery of by product
- e) Recycle and reuse

Benefits of EIA

- Promoting integrated environment and development decision making.
- Reduced time and cost of project implementation.
- Facilitating the design of environmentally sustainable policies and plans.
- Cost saving modifications in project planning.
- Consideration of a large range of alternative.
- Increased project acceptance.
- Avoiding environmental impacts and violations of laws and regulations.
- Reduction of waste treatment expenses.
- Maintenance of biodiversity.
- Reduced resources utilization.
- Improved human health.
- Mechanism for public engagement to sustainability.

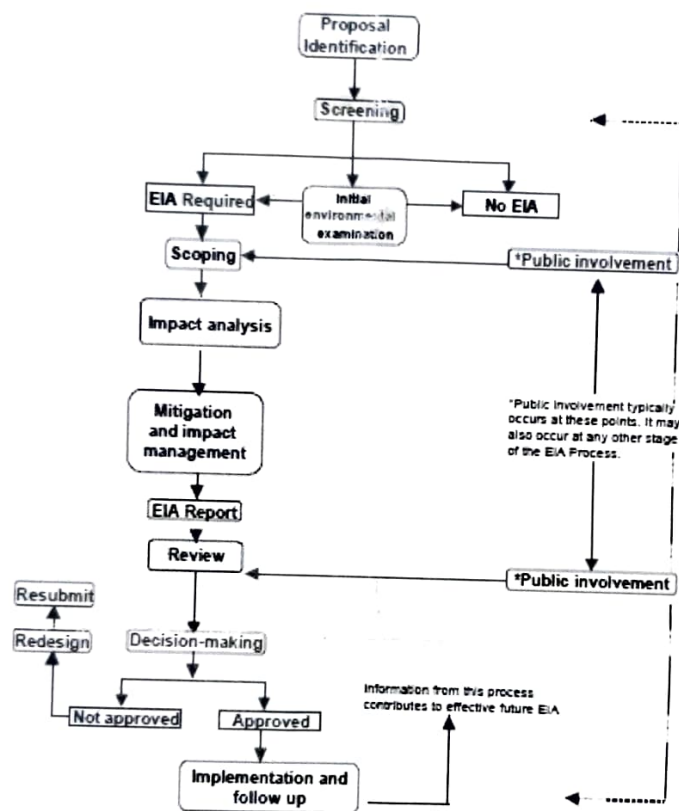
FLOW CHART OF EIA PROCESS

THE FLOWCHART BELOW DEPICTS THE BASIC ELEMENTS OF GOOD EIA PRACTICE:



OR

Generalised EIA Process Flowchart



Steps in EIA process or step by step procedure of EIA

The EIA process following steps is

- **Screening** - To determine whether or not a proposal should be subject to EIA and if so at what level of detail.
- **Scoping** - To identify the important issues, impacts and prepare terms of reference for EIA.
- **Impact analysis** - To identify and predict the likely environmental, social and other related effects of the proposal.
- **Mitigation and impact management** - To establish measures to prevent reduce or compensate for impacts.
- **Reporting** - To prepare the information necessary for decision making.

- **Review** – To check the quality of the EIA report, whether the report meets its terms, provides a satisfactory assessment.
- **Decision making** – To approve or reject the proposal and set conditions.
- **Follow up** – To monitor, manage and audit impacts of project implementation
- **Public involvement** – To inform and consult with participating public professional groups, NGOs, local authorities, general community etc.

ENVIRONMENTAL STUDIES**Dr. H. U. Raghavendra (H R)****Effects of housing, industry and infrastructure on environment: Use of natural resources in the development****Introduction:**

Housing: It is one of the basic human needs just next to food and clothing. A fundamental principle that everyone should have a decent home at a price they can afford. Increasing population pressure on houses made high cost on land and infrastructure materials.

Effect of housing on landuse

- Housing area witnessed tremendous change in land use and land cover.
- Due to housing agriculture area, forest land and water bodies have decreased in the urban areas.
- In many regions, watersheds are endangered owing to contamination from the municipal wastewater and solid waste disposal.
- Expansion of housing especially in urban areas brought the problem of contamination of environmental air, soil, surface water bodies and ground water aquifer etc. Which have direct effect on human health, live stock and plant life.

Effect of house building materials

Building material is any material which is used for a construction purpose. Today the production and assembly of various building materials is having huge industrial network. Invention of new building materials causes huge environmental damage due to massive resource extraction and disposal of waste generated in the industries.

The commonly used building materials are mud, stone, wood, brick, concrete, metal, fabric, sanitary ware and tiles etc. There are significant environmental and health impacts associated with the production, transportation, use, maintenance and demolition of common building materials.

The environmental impacts of many common building materials are

Steel:

- It is the single largest metal use in the construction activity followed by aluminium and brass.
- The major environmental concern include energy, resource use, land and habitat loss from mining activities, air and water quality degradation as a result of mining and manufacturing activities.
- The principle risks to air quality include dust from ore refinement.
- Metal are considered to be the most recyclable building material since it is easily separated from the waste stream and preprocessed into a high quality product.

Cement:

- Cement and concrete are the largest used in building materials.
- The effect includes land and habitat loss from mining activities.
- Air and water quality degradation from materials gaining and manufacture.
- Land use for disposal of waste materials and demolition debris.

Wood:

- Wood and plywood are the largest used building materials.
- Wood is a renewable resource depends on sound management practices.
- It is required to be replanted faster than they are being harvested today.

ENVIRONMENTAL STUDIES**Dr. H. U. Raghavendra (H R)**

- Removal of trees causes loss of biodiversity, ecological impact and soil erosion.
- However in future the softwood plywood will be future demand. The pressure on the forest will increase.
- Wood considered is of two types softwood and hardwood. Softwood manufactured with waterproof which is used primarily for structural purposes such as sheating and siding. Hardwood manufactured and used mainly for decorative purposes such as cabinets and paneling etc.
- Wood waste can be recycled into chips for composite wood products.

Glass:

- It has become one of major building material.
- Mining of glass sand, limestone and soda ash results in particulate pollution, soil erosion and habitat alteration.
- Pollutant such as runoff and air pollution associated with energy consumption for mining, processing and transporting materials.
- Scrap glass is generally recycled into glass making process.
- Glass demolition wastes are usually disposed of in landfills.

Paints:

- Manufacturing of the paints is one of the major industries.
- Most paints are produced primarily from petroleum derived substances and heavy metals.
- Care must be taken in recovery of waste and disposal of possible lead containing debris.
- Paints emits organic solvents that may be irritating and hazardous etc.

Effect of Industries

- Manufacturing activities have a tremendous influence on the environment.
- Energy and petroleum to make petro-chemicals.
- Ore to make metals must be dug from ground to provide essential raw materials.
- Huge land for factories and roads must be built to transport raw materials and manufactured products.
- Causes significant water and soil pollution from production of hazardous wastes.

Environmental effects of mining

Environmental issues include erosion, formation of sinkholes, dangerous sites such as deep holes, destruction of the environment, loss of biodiversity and contamination of groundwater by chemicals from the mining process and products.

It is estimated that each year around 27 billion metric tons of non extractable ore and over burden are produced. The mineral industry consumes around 5-10% of world energy use making it a major contributor to air pollution and to emission of greenhouse gases. As deeper deposits are mined, even more energy will be needed to extract and transport.

- a) Tailings: The byproducts of mineral refining consist of waste tailings. Large quantities of cyanide solution are used in tailings to extract low level of gold from ore, posing obvious toxicological hazards.
- b) Acid mine drainage: It is also called acid rock water or acid rock drainage refers to the outflow of acidic water from abandoned metal mines or coal mines. Coal has significant

ENVIRONMENTAL STUDIES**Dr. H. U. Raghavendra (H R)**

sulphur content, such coal generate highly acidic metal rich drainage when exposed to normal rainfall. Tailings ponds may also be a source of acid rock drainage.

- c) Abandoned mine dangers: Old mines are often dangerous and can contain deadly gases, snakes and other animals. Modern mining companies in many countries are required to follow strict environmental codes ensuring the area mined is returned to its original state. The mining companies are forced to do reclamation (restoring mine land). This reclaimed land has renewed vegetation and wildlife and can even be used for farming.

Transportation

It is the movement of people and goods from one place to another. The transportation is divided into three aspects such as infrastructure, vehicle and operations.

Infrastructure includes the transport networks (roads, railways, airways, etc) that are used as well as terminals (such as bus stations, railway stations, etc).

Transport infrastructure effects the environment

- a) Emissions: Transport is a major use of energy and transport burns most of the world's petroleum. Hydrocarbon fuels produce carbon dioxide, a green house gas causes global climate change. The inefficient engines create air pollution including nitrous oxides and carbon monoxide. Vehicle's emission affects people's health.
- b) By products: Transport infrastructure (roads or parking spaces) covers 25-30 percent of land in most modern cities. Transport allows urban expansion, which can consume or damage valuable agricultural lands, natural habitats etc. Roads or rail tracks can lead to biodiversity losses.
- c) Bio-security: Transport can increase bio-security risks as well as undesirable goods and people. International travel and trade can allow new organisms or diseases to enter other countries. Organisms and diseases can also spread within the country with the assistance of transport.
- d) Noise: Noise and vibrations can affect people who live or work near busy roads, rail facilities, airports or under flight paths. This can cause stress, need medical conditions and interfere with daily activities such as sleeping.
- e) Other pollutions: Many difficult waste are transported such as older air conditioning system may contain CFCs. Transporting toxic runoff and parking lots that can pollute water supplies.