Environmental Implications of Sectoral Development

What are the sectors of Environmental Implications?

- Agricultural sector
- Industrial sector
  - Mining industry
  - Textile
  - Paper & Pulp
  - Meat
  - Food
  - Tannery
  - Cement
  - Petrochemical
  - Pharmaceuticals
  - Electronic goods manufacturing industry
  - Fertilizer/pesticides
  - Construction industry
  - Automobile industry
  - Chemical industry
- Water Development, Flood Control & Irrigation
- Energy sector
- Transport & Communication
- Infrastructure development
- Tourism
- Water supply & Sanitation sector

Describe the impacts of Agricultural sector on environment

Agriculture has a profound impact on the environment on the following:

– **Air pollution:** drift of agricultural chemicals (pesticides, herbicides, fungicides, fertilizers) pollen, dust

– **Water pollution:** leaching of nutrients and eutrophication. Contamination of groundwater and surface water by pesticides, herbicides and fertilizers.

– **Water quantity:** High yielding needs huge amount of water for irrigation.

– **Soil degradation & pollution:** irreversible losses of soil due to soil sealing & erosion, contamination from increased use of pesticides, fertilisers etc., acidification, salinisation and compaction. Loss of organic matter, soil biodiversity and fertility loss is due to unsustainable practices of agriculture.

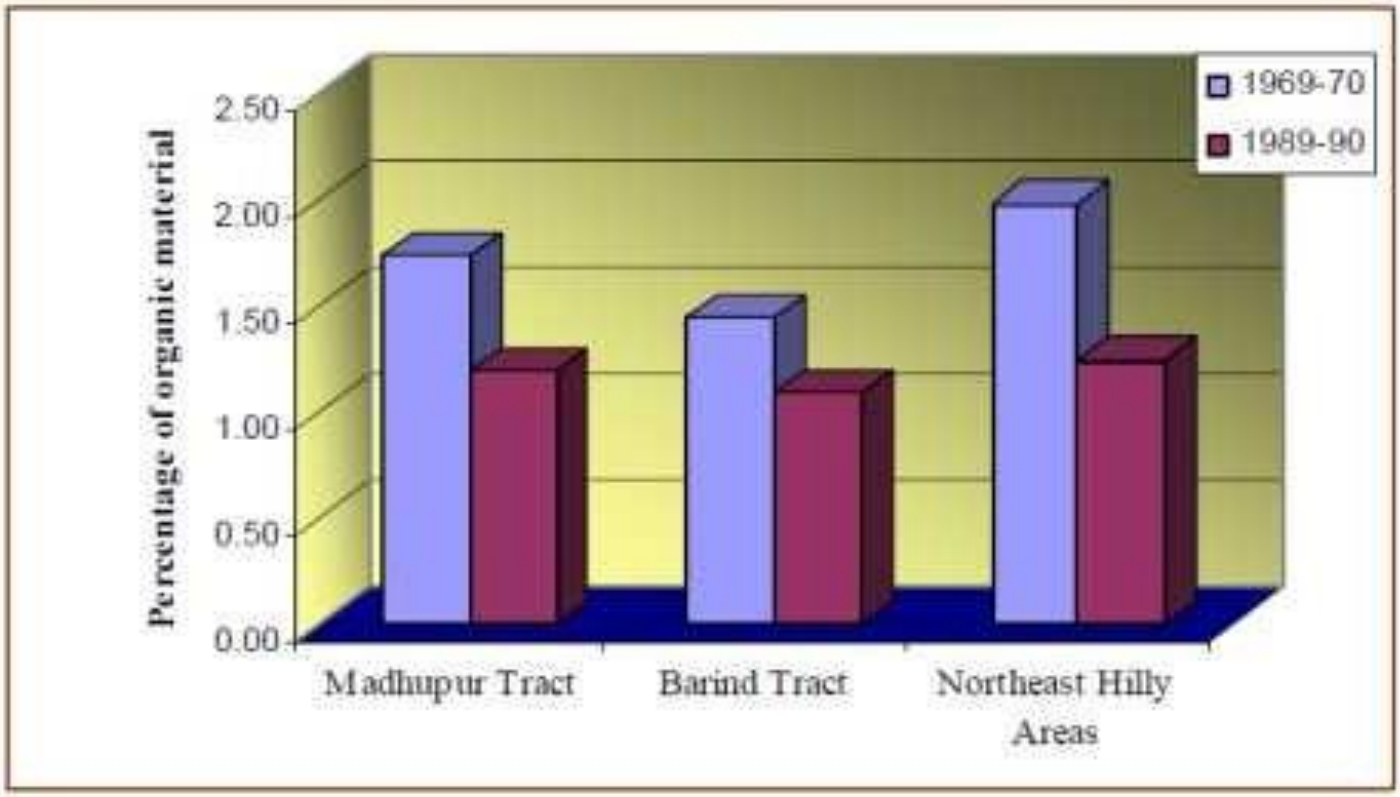
Describe the impacts of Agricultural sector on environment

– **Greenhouse gas emission:** Agriculture is a significant contributor of CH_4 and NO_2 gases.

– **Biodiversity loss:** Key factors causing the decline in biodiversity include habitat disturbance and changes in the food chain. As the agricultural production has intensified, all levels of biological diversity (genetic, species, and habitats) have declined in farming environments.

– **Human health:** Toxicity of chemicals in food chain and ultimately affect human health

Agricultural sector



Changes in Organic matter from 1969-70 to 1989-90 (Karim *et. al.*, 1994)

What measures can be taken in Agricultural sector to protect the environment?

- Some measures:

– Developing measures that will encourage flexibility in land use. Crop management in relation to climate change is a present concern.

– Increasing water management efficiency in order to sustain agricultural production under changing climatic condition

– Identification and preservation of plant and animal genetic diversity as key natural resources sustaining future agrifood, aquaculture and bioenergy production.

– The application of agrochemicals which adversely affect the fertility as well as the organic properties of soil and which also produce adverse impact on man and animals should be regulated.

What measures can be taken in Agricultural sector?

Continued……

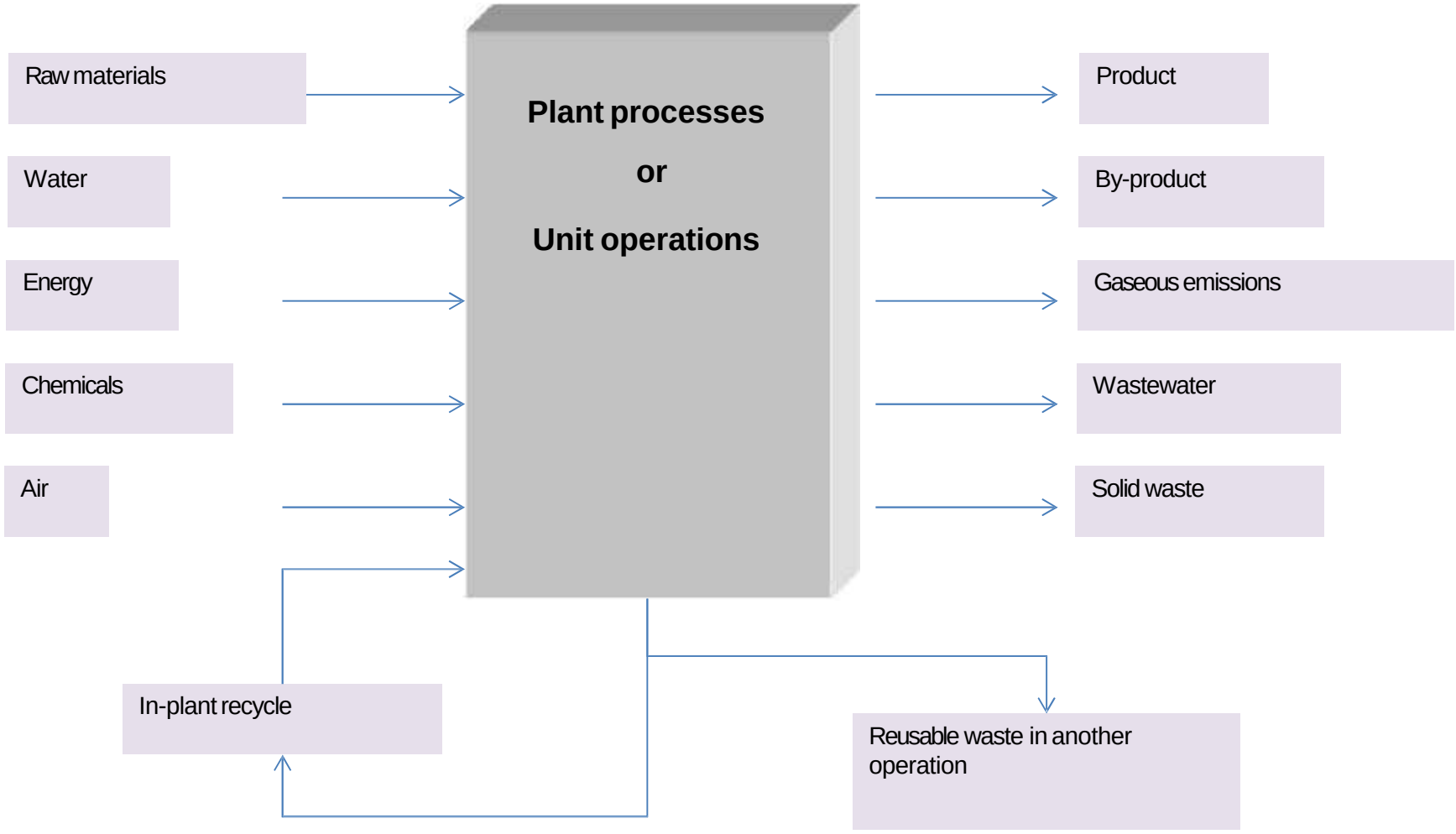
– Production, import and use of the harmful chemicals should be phased out gradually and should be prohibited as soon as possible

– Integrated pest management should be used. Through protection and multiplication of snakes, frogs, lizards, turtles and other wild animals, natural methods of pest control should be encouraged.

– Organic farming should be encouraged. Organic farming should promote and enhance agro ecosystem health, including biodiversity, biological cycles and soil biological activity . Organic farming focuses on sustainability, environmental protection and animal welfare by reducing or eliminating chemical inputs such as fertilizers, pesticides.

Industrial sector

- Industrialisation creates employment, eradicates poverty, promotes gender equality, and labour standards, and enhances greater access to education and healthcare.
- Industrial processes poses negative environmental impacts, causing climate change, loss of natural resources, air, soil and water pollution and extinction of species.
- Pollution contributed is industry specific.


Raw materials
Water
Energy
Chemicals
Air
Plant processes
or
Unit operations
Product
By-product
Gaseous emissions
Wastewater
Solid waste
In-plant recycle
Reusable waste in another operation

Pollutants from Different Industries

(http://www.eolss.net/sample-chapters/c09/e4-11-02-00.pdf)

Industrial Sectors	Pollutant Forms			
	Gas	Solid Waste and Solids	Water	Other
Iron and Steel	SO_x, NO_x, HC, CO, H_2S, Toxic Chemicals	Slag, Wastes, Sludge from effluent treatment	BOD, COD, Oil, Metals, Acids, Phenol, Cyanide	Noise, Particulate
Textile and Leather	SO_x, HC	Sludge (chromium) from effluent treatment	BOD, Solids, Sulphates and Chromium, Dyes	Odour, Noise, Particulate
Pulp and Paper	SO_x, No_x	Sludge from effluent treatment	BOD, COD, Solids, Chlorinated organics compounds	Odour, Noise, Particulate
Petrochemicals, Refineries	SO_x, NO_x, HC, CO, H_2S, Toxic Chemicals	Spent catalysts, Tars, Sludge	BOD, COD, Oil, Phenols and Chromium	Odour, Noise, Particulate
Chemicals	Organic Chemicals	Sludge from pollution treatment and process waste	COD, Organic Chemicals, Heavy Metals, Solids and Cyanide	Odor, Toxic Chemicals

Water Pollution by Industries in Bangladesh

(http://reedconsultingbd.com/media/k2/attachments/Are_textile_industries_the_main_source_of_water_pollution_in_Bangladesh_March_Final_2011.pdf)

Industry	Water Pollution	Pollution Product (PP)	Ranking	Polluters
Textile	Big	335	1	Dyes, Chemicals
Leather	Extreme	188	2	Chemicals, Heavy metals
Agriculture	Moderate	108	3	Pesticides (DDT), Fertilizers
Paper	Moderate	67	4	Toxic Chemical
Construction	Small	0.14	5	Construction Materials
Transport	Small	0.02	6	Chemicals

What are the effects of Mining Industry on the environment? Explain

- **Air:** Mines produce dust from bursting operations and haul roads. Coal mines release CH4 and other GHGs. Smelter operations with insufficient safeguard have the potential to pollute the air with heavy metals, sulphur di oxide and other pollutants.

- **Water:** mining industry uses large quantities of water. Mining releases sulphur oxides into the air which reacts with water and produces sulphuric acids. This, together with various trace elements affects surface water and groundwater and impacts the eco system.

What are the effects of Mining Industry on the environment? Explain

- **Land:** The movement of rocks during mining activities and the overburden materials overlying the mineral deposits impacts land severely.
- **Health & Safety:** Mining operation is very dangerous and hazardous. Underground mining is more hazardous than surface mining because of poor ventilation, visibility and danger of falling of rocks. The greatest health risk arise from dust which may lead respiratory diseases and from exposure to radiation depending upon the mine type.


I'm bored!
Please Stop

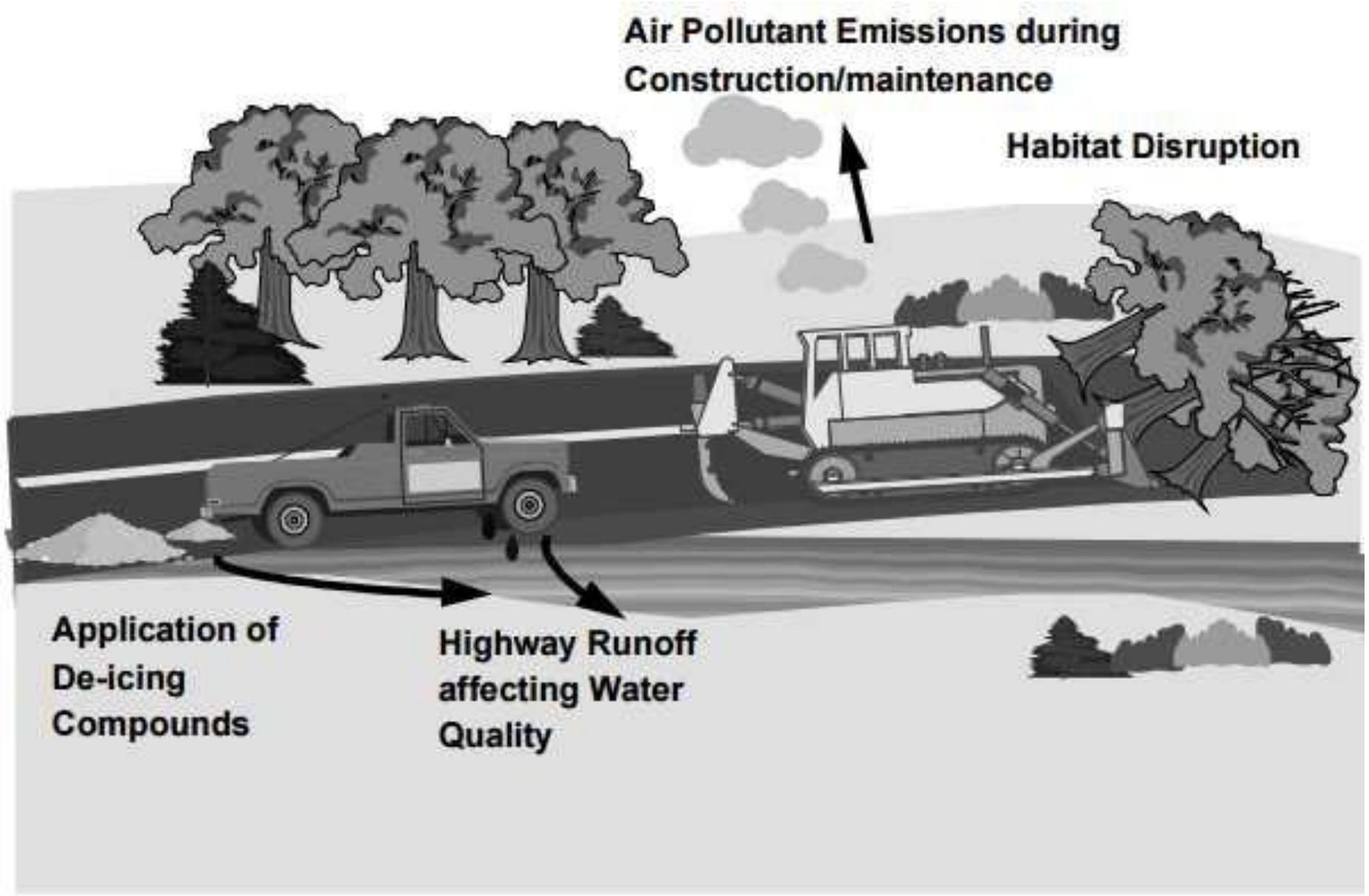
What measures can be taken in Industrial sector to protect the environment?

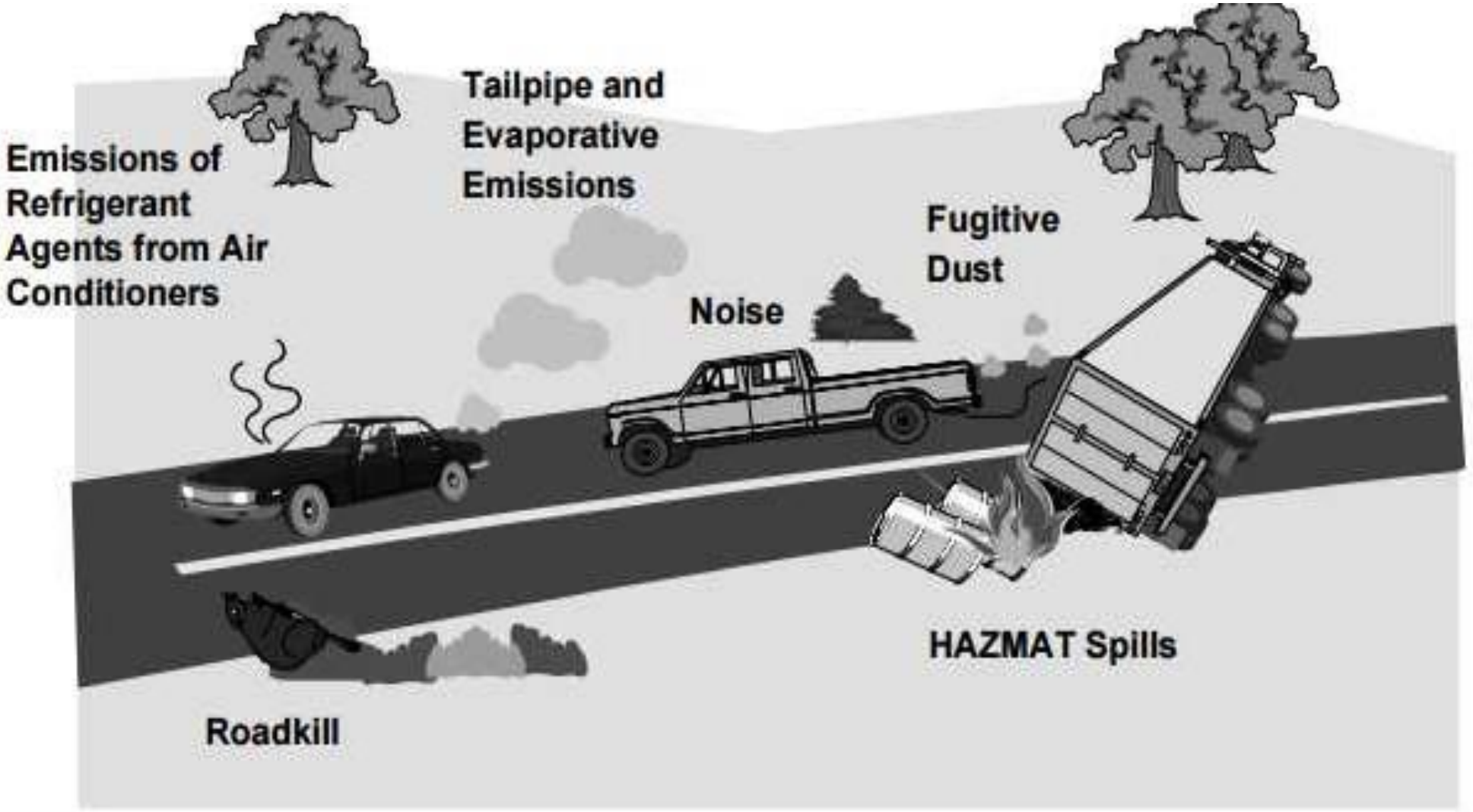
- Ensure EIA in all new industries both public and private
- Encourage development of environmentally sound and appropriate technologies and initiative on research and foundation in the field of industry.
- Prevent wastage of raw material and ensure their sustainable use in industry.
- Promote cleaner production processes.
- Industries that are potential polluters will make provision to introduce pollution control measures
- 4R policy should be encouraged

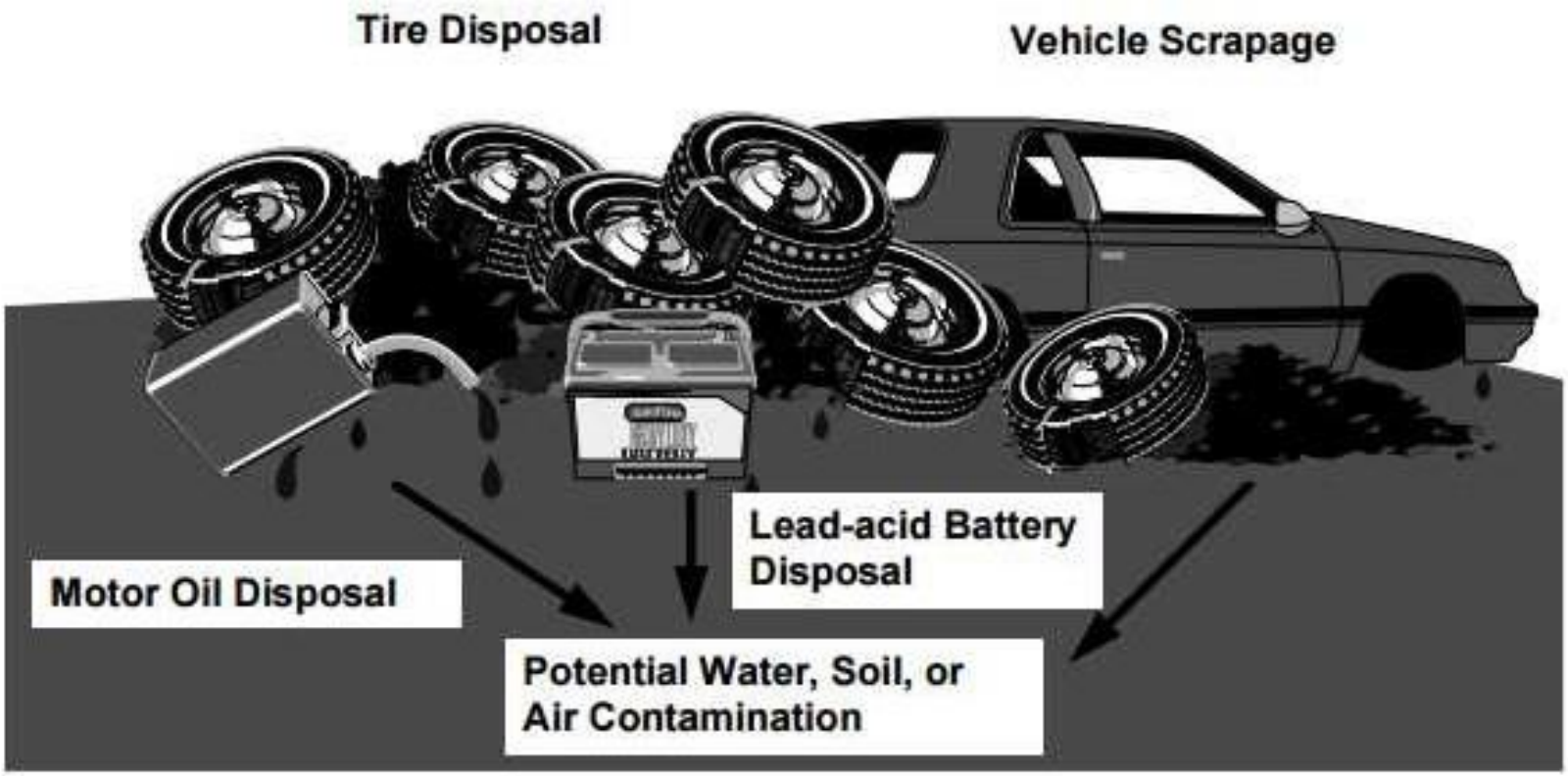
Tourism Industry

- Resource use
  - Energy
  - Water
  - land
- Pollution and waste outputs
  - Water quality
  - Air quality
  - Noise
  - Solid waste generation
- Transportation
- Development & land use
- Economy
- Education
- Eco-system alteration
  - Impacts on wildlife
  - Aesthetic & cultural impacts

Impacts in Transport sector




Emissions of Refrigerant Agents from Air Conditioners
Tailpipe and Evaporative Emissions
Noise
Fugitive Dust
HAZMAT Spills
Roadkill


Tire Disposal
Vehicle Scrapage
Motor Oil Disposal
Lead-acid Battery Disposal
Potential Water, Soil, or Air Contamination

Impacts of Transportation sector on Environment

How Transportation sector change the quality of air?

- Emission of carbon-dioxide (CO_2) from the burning of fossil fuels is a major contributor. For the transport sector, the greenhouse gas emissions are dominated by the CO_2 emissions from burning fossil fuels. These are strongly related to transport energy use.
- Release of Particulate matter (PM_{10}, $PM_{2.5}$), Nitrogen oxides (NOx), Sulphur oxide (SO_2). Ozone (O_3), Volatile organic compounds (VOC).
- Health impacts such as aspiration diseases due to the fine particles ($PM_{2.5}$/PM_{10}, other air pollutants). Exhaust emission particles are hereby considered as the most important pollutant. In addition, Ozone (O_3) has impacts on human health.

Impacts of Transportation sector on Environment

How Transportation sector change the quality of air?

- Building and material damages: Impacts on buildings and materials from air pollutants. Mainly two effects are of importance: soiling of building surfaces/facades primarily through particles and dust. The second, more important impact on facades and materials is the degradation through corrosive processes, due to acid air pollutants like NOx and SO_2.
- Crop losses in agriculture and impacts on the biosphere: crops as well as forests and other ecosystems are damaged by acid deposition, ozone exposition and SO_2
- Impacts on biodiversity and ecosystems (soil and water/groundwater): the impacts on soil and groundwater are mainly caused by eutrophication and acidification due to the deposition of nitrogen oxides, as well as contamination with heavy metals (from tire wear and tear).

Impacts of Transportation sector on Environment

– Noise

- Traffic noise has a variety of adverse impacts on human health. The World Health Organization (WHO) has recognized community noise, including traffic noise, as a serious public health problem.
- Traffic noise has various adverse effects. The most widespread effect is simply annoyance. In addition, there is substantial evidence for serious health problems caused by traffic noise. The main problem is disturbance of sleep patterns, which affects cognitive functioning (especially in children) and contributes to certain cardiovascular diseases. There is also increasing evidence for an impact of noise raising blood pressure (Den Boer & Schroten, 2007).

Impacts of Transportation sector on Environment

– Land Use

- Transportation facilities have an impact on the urban landscape. The development of port and airport infrastructure is significant features of the urban and peri- urban built environment. Social and economic cohesion can be severed when new transport facilities such as elevated train and highway structures cut across an existing urban community. Arteries or transport terminals can define urban borders and produce segregation. Major transport facilities can affect the quality of urban life by creating physical barriers, increasing noise levels, generating odors, reducing urban aesthetic and affecting the built heritage

Impacts of Transportation sector on Environment

How Transportation sector change the quality of water?

- Water quality
  - Transport activities have an impact on hydrological conditions. Fuel, chemical and other hazardous particulates discarded from aircraft, cars, trucks and trains or from port and airport terminal operations, such as de-icing, can contaminate rivers, lakes, wetlands and oceans.
  - The main effects of marine transport operations on water quality predominantly arise from dredging, waste, ballast waters and oil spills.
  - Waste generated by the operations of vessels at sea or at ports cause serious environmental problems. Besides, various types of garbage containing metals and plastic can persist on the sea surface for long periods of time and can threaten the ecosystem.

Impacts of Transportation sector on Environment

How Transportation sector change the quality of soil?

- Soil quality
  - Soil erosion and contamination
  - Shipping activities causes damage in confined channels such as river banks
  - Highway construction, airport developments etc. lead loss of fertile land and productive soils.
  - Soil contamination can occur through the use of toxic materials by the transport industry.
  - Fuel and oil spills from motor vehicles are washed on road sides and enter the soil. Chemicals used for the preservation of railroad ties may enter into the soil. Hazardous materials and heavy metals have been found in areas contiguous to railroads, ports and airports.

Impacts of Transportation sector on Environment

Biodiversity changes

- Transportation also influences natural vegetation.
- The need for construction materials and the development of land based transportation has led to deforestation.
- Transport routes have required draining land, thus reducing wetland areas and driving-out water plant species.
- The need to maintain road and rail right-of way or to stabilize slope along transport facilities has resulted in restricting growth of certain plants or has produced changes in plants with the introduction of new species different from those which originally grew in the areas.
- Many animal species are becoming extinct as a result of changes in their natural habitats and reduction of ranges

Impacts of Transportation sector on Environment

- Resource use
  - Large amounts of oil based resources used for transport
  - Materials are extracted for infrastructure construction
- Wastes production
  - Vehicles contain materials such as lead, mercury, cadmium, hexavalent chromium and other environmentally harmful substances.
  - Existing cars by weight, about three-quarters of a car is steel and aluminium, which is recycled. The rest, which is mainly plastics, is disposed of by incineration or in landfills. Cars also contain dangerous liquid substances (anti-freeze, brake fluid, oil, etc.) that are harmful to the environment if not handled properly (EEA, 2003).
  - Vehicles, fluid, tyres, spent oil, scrap materials etc. are produced

Some measures in Transport Sector

- Development of alternative fuels and ensure greater energy efficiency
- Set demanding targets for the reduction of greenhouse gas emissions from transports
- Behavioural change and adaptation polices are also needed which ensure that the transport system is more resilient to the effects of climate change.
- Continued action is needed to make vehicles more recyclable and to require the industry to recycle used vehicles.
- development of more efficient engine and fuel technologies should be needed to reduce the emissions of air pollutants
- Greater emphasis is needed on the design of vehicles and infrastructure which are fit for purpose, use recyclable and low density materials and help improve the life-cycle sustainability of the transport system.

Impacts in Energy Sector

- Non renewable
  - Coal
  - Natural Gas
  - Nuclear Power
  - Oil
- Renewable
  - Wind
  - Solar
  - Biomass
  - Hydropower
  - Tidal
  - Geothermal
  - Biofuel
  - Waste

Nuclear

- Mining hazard of radioactive material
- Accidental release of radioactive materials
- Dose not emit SO_X, NO_X, CO_X
- Nuclear waste disposal

EIA Methods

What is mean by EIA Methods?

- Approached developed to identify, predict and value changes of an action
- Mechanisms by which information is collected and organized , evaluated and presented
- Concerned with predicting the future states of environmental parameters and may involve mathematical modeling

EIA methods

Write some Methods of EIA?

- **Some common methods**
- Checklists
- EES
- Matrices
- Network
- Cost Benefit Analysis
- SMW
- Overlays/GIS

EIA Methods

Why do we need EIA methods?

- The administrative procedures of EIA Varies from country to country
- Provides uniform standard
- EIA methodologies ensure that the best possible information from EIA procedures is available to decision makers and the public
- Identify the main environmental issues and aspects
- Identify significant positive and negative impacts
- Evaluate the overall environmental impact of the scheme to enable comparison between alternative proposals

HURRY UP

NO STUDY NOW

Checklists

Write short note on checklist method of EIA?

- Standard lists of the types of impacts associated with a particular type of project
- Primarily organizing information or ensuring that no potential impact is overlooked.
- Should enable identification of impacts on
  - Soil
  - Water
  - Air
  - Flora
  - Fauna
  - Resources
  - Recreation
  - cultural

Checklists

- Types of checklists
  - Simple checklists: a list of environmental parameters with no guidelines on how they are to be measured and interpreted
  - Descriptive checklist: includes an identification of environmental parameters and guidelines on how to measure data on particular parameters.
  - Scaling checklist: similar to a descriptive checklist, but with additional information on subjective scaling of the parameters
  - Questionnaire: three types of answer, ‘ye’s, ‘no’, ‘may be’

Checklists

What are the advantages and disadvantages of checklist method of EIA?

- Advantages
  - can structure initial stages of assessment
  - help to ensure that vital factors are not neglected
  - are easy to apply, particularly by non-experts

- Disadvantages
  - They are too general or incomplete;
  - They do not illustrate interactions between effects;
  - The identification of effects is qualitative and subjective
  - pose danger of “tunnel vision”

Matrices

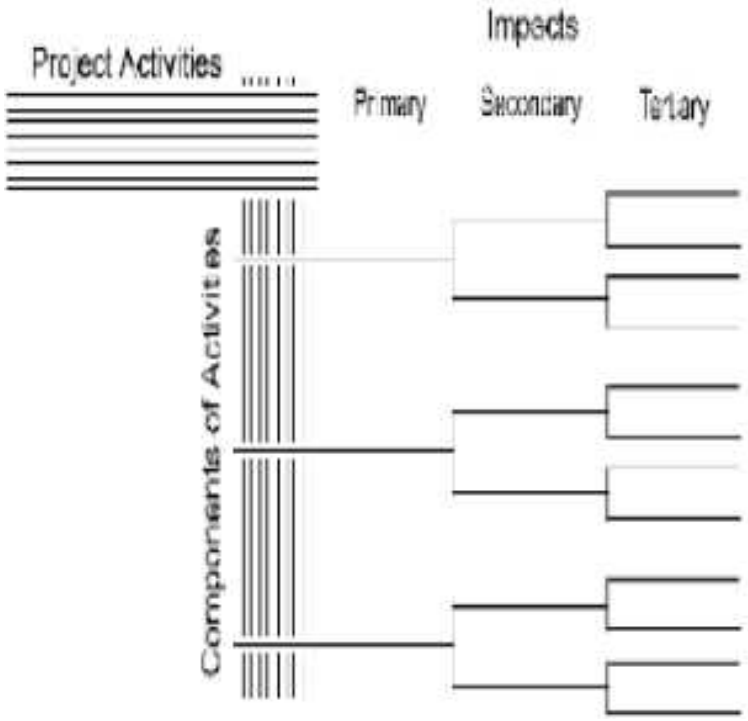
- Matrix methods identify interactions between various project actions and environmental parameters and components
- Allow for the identification of cause-effect relationships
- Can address impact severity and significance
- Qualitative or quantitative estimates can be used
- A matrix of potential interactions is produced by combining these two lists (placing one on the vertical axis and the other on the horizontal axis)

Networks/Flowcharts

- Flowcharts and impacts trees, including network diagrams, enable the analysis of the inter-relationship between causes and effects and enables the analysis of indirect and cumulative impacts.

Networks

- Network diagrams provide a means for displaying first, secondary, tertiary, and higher order impacts.
- To develop a network, a series of questions related to each project activity (such as what are the primary impact areas, the primary impacts within these areas, the secondary impact areas, the secondary impacts within these areas, and so on) must be answered.



Networks/Flowcharts

What are the advantages and disadvantages of flowcharts method of EIA?

- Advantages:
  - integrated assessment, instead of discipline by discipline
  - inter-relations between causes and effects, including indirect impacts
  - cumulative impact assessment - communication (when simple).
- Disadvantages:
  - complexity (especially visually complex)
  - difficult to distinguish and quantify magnitudes (and importance) of different impacts

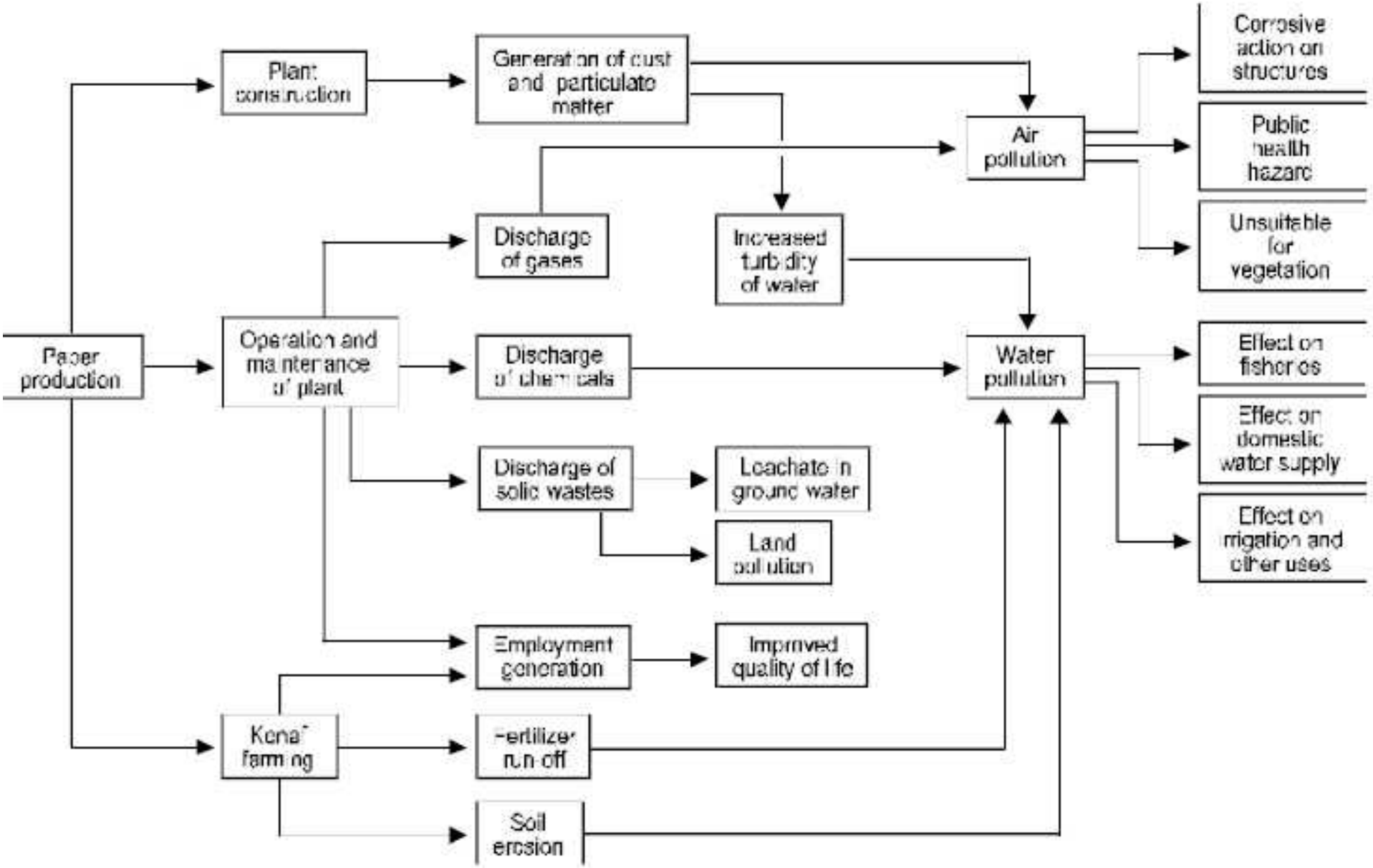


Figure 3-7: Network of pulp mill impacts (*source:* Lohani and Halim, 1983).

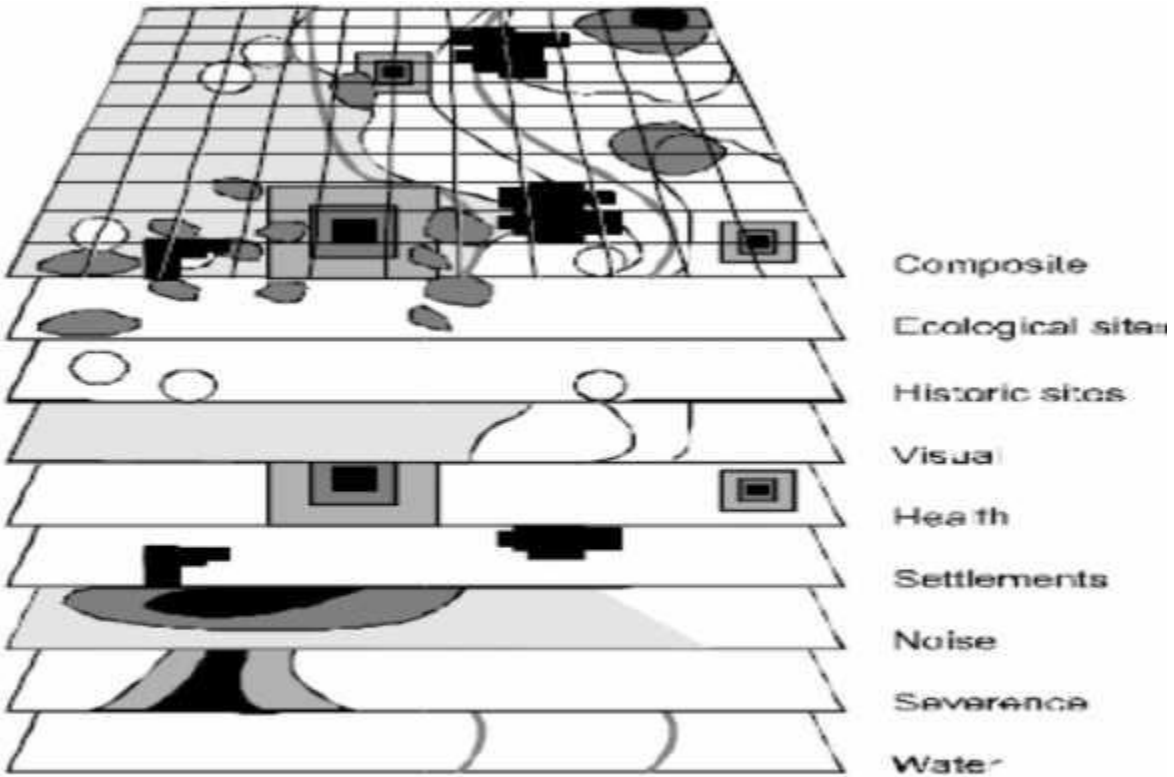


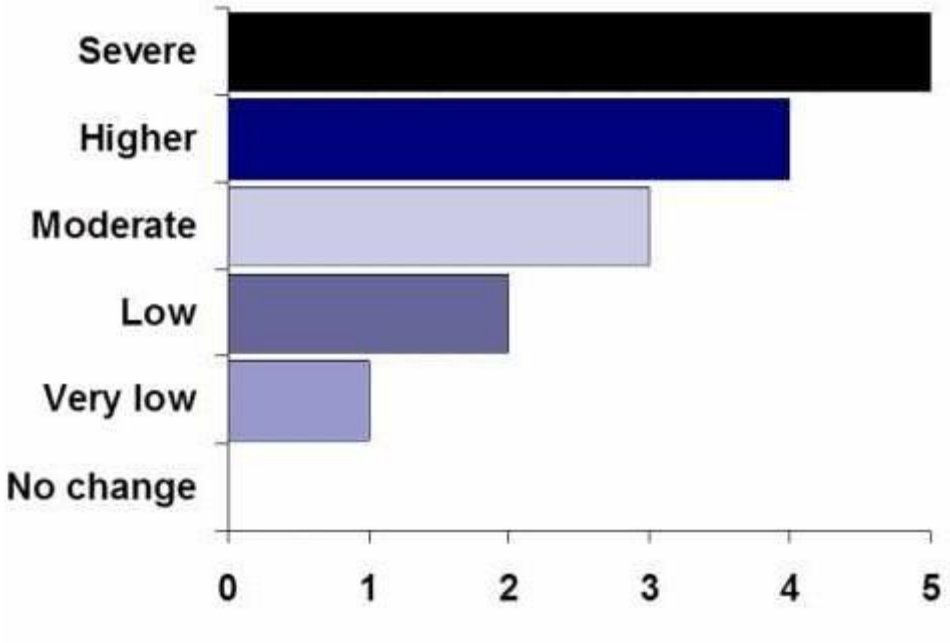
Figure 3-13: Example of overlay method (*source:* Wathern, 1988).

Essentially, the overlay method divides the study area into convenient geographical units based on uniformly spaced grid points, topographic features, or differing land uses. Field surveys, topographical land inventory maps, aerial photography, etc., are used to assemble information related to environmental and human factors within the geographical units. Factors are composed by assembling concerns that have a common basis, and regional maps are drawn for each factor. Through the use of overlays, land use possibilities and engineering feasibility are visually determined

(McHarg, 1968).

EES

- Changes of environmental parameters
  - Severe (+5 or -5)
  - Higher (+4 or -4)
  - Moderate (+3 or -3)
  - Low (+2 or -2)
  - Very Low (+1 or -1)
  - No change (0)



Impact Evaluation

ENVIRONMENTAL PARAMETERS	Relative Importance Value	Degree of Impact	EIV
I. ECOLOGICAL			-19
Fisheries	10	-2	
Forest	5	0	
Tree Plantation	2	+1	
Wetland/Wetland Habitant	4	0	
Nuisance Plant/Eutrophication	1	-1	
II. PHYSICO-CHEMICAL			-13
Erosion and Siltation	2	-1	
Regional Hydrology/Flooding	6	-1	
Drainage Congestion/Water logging	5	-1	
Obstruction to Waste Water Flow	3	0	
Dust Pollution/Noise Pollution	2	0	

Impact Evaluation

ENVIRONMENTAL PARAMETERS	Relative Importance Value	Degree of Impact	EIV
III. HUMAN INTEREST			+27
Loss of Agricultural Lands	8	+3	
Employment Opportunities	8	+4	
Navigation/Boat Communication	3	-3	
Commercial and Service Facilities	6	+3	
Industrial Activities	3	+2	
Irrigation Facilities	2	+3	
Landscape	2	-1	
Total Environmental Impact Value			-5