

## section: D (20 marks)

### 5. Public Health Engineering:

#### 5.3 Environment

##### 5.3.8 concept of environmental assessment:

##### \* Environmental Assessment:

- ↳ It is an art and science of identifying and evaluating results of interactions between environment variables and human activities in nature.
- ↳ Environmental assessment is a science which deals with methodologies and techniques for identifying, predicting and evaluating the impacts associated with particular projects.

##### Q. Why Environmental assessment is an art or managerial tool...?

Ans: Environmental assessment is an art or managerial tool because...

- ① it reflects the sensitivity towards nature.
- ② it carries out environmental analysis of actions.
- ③ it ensures the compliance with policy and legal provisions
- ④ influences decision making process.

##### Types of environmental assessment:

###### 1. Strategic environmental assessment:

- ↳ for plans, programs and strategies.

###### 2. Environmental impact assessment:

- ↳ for project and development proposal.

###### 3. Habitual regulation appraisal:

- ↳ for plans or projects affecting natural sites.

## Types of Environmental Assessment as per <sup>EPA-2019:</sup> <sup>EPA-2076:</sup>

- Brief Environmental study (BES).
- Initial Environment Examination (IEE).
- Environmental Impact Assessment (EIA).

### a. Brief Environmental Study (BES)

- ↳ BES is a study to be made for measures to be adopted for avoiding or mitigating the adverse effects on environment as a result of implementation of any proposal.
- ↳ Schedule 1 of EPR-2077 has mentioned about the projects to carryout brief environmental study.

### b. Initial Environment Examination: (IEE)

- ↳ It is an analytical study or evaluation to be conducted to ascertain whether implementing a proposal have significant adverse impacts on the environment or not.
- ↳ It also deals about the measures to be adopted for avoiding or mitigating such impacts by any means.
- ↳ Schedule 2 of EPR-2077 has mentioned about the projects to carry out IEE.

### c. Environmental Impact Assessment:(EIA)

- ↳ EIA means the detailed study and evaluation to be made to ascertain whether implementing a proposal have significant adverse impact on environment or not and measures to be adopted for avoiding and mitigating such impacts.
- ↳ Schedule 3 of EPR-2077 has mentioned about the projects to carryout EIA.

## Q. What are the foundation or provision for EPA in Nepal? [5 marks]

Ans: Foundation for EPA in Nepal started in 2047 B.S. by the then government of Nepal.

- ↳ Constitution of Nepal 2047 laid the foundation of EPA in Nepal.
- ↳ Concept of EPA started during seventh periodic plan.
- ↳ Progress were made in Environmental protection issue during 8<sup>th</sup> five year plan (1992 - 1997 A.D.).
- ↳ In 1993 A.D., Government of Nepal introduced National Environmental Impact Assessment guidelines:
  - provides process of EIA and SEA for development projects.
- ↳ In 1997 A.D., The Environmental Protection Act developed.
- ↳ In 1997 A.D., The Environmental protection Regulation developed.

### Revised EPA and EPR,

- ↳ In 2076 B.S., The Environmental protection Act (Revised).
- ↳ In 2077 B.S., The Environmental protection Regulation (Revised).

## Q. What are the needs for revision of EPA-1997 (2054)?

[2 marks]

Ans: Needs for revision of EPA-1997 are:

- ① New concept in environmental management like strategic Environment Assessment (SEA), climate change etc.
- ② New corrections and their obligations.
- ③ New constitution with three level of government and need to deliver right to province and local government.

Q. What are the major features of EPA-2076? [5 marks]

Ans: Major features of EPA-2076 are:

- ↳ section-3 of EPA-2076 has provision for conducting three level of environment study namely,
  - a. Brief Environmental study.
  - b. Initial Environmental Examination.
  - c. Environmental Impact Assessment.
- ↳ section-12 of EPA-2076 has provision of environmental examination after completion and operation of projects by MOFE or appointed authority.
- Section-14 of EPA-2076
  - ↳ It has provision for approval and implementation of environmental studies to province level / local government.
  - ↳ It has provision of environmental protection area - chapter: 5
  - ↳ EPA-2076 has increased fine (punishment) with reference to previous act.
    - EPA-1997 Act  $\rightarrow$  100000 threshold.
    - EPA-2076 Act  $\rightarrow$  300000
  - ↳ It has a provision for national heritages - chapter: 5
  - ↳ It has a provision relating to climate change - chapter: 4
  - ↳ It has a provision regarding control of pollution - chapter: 3

Note: EPA-2076 has:

- Chapter- 7
- section- 47

FPR-2077 has:

- Paragraphs - 11
- schedules. 21

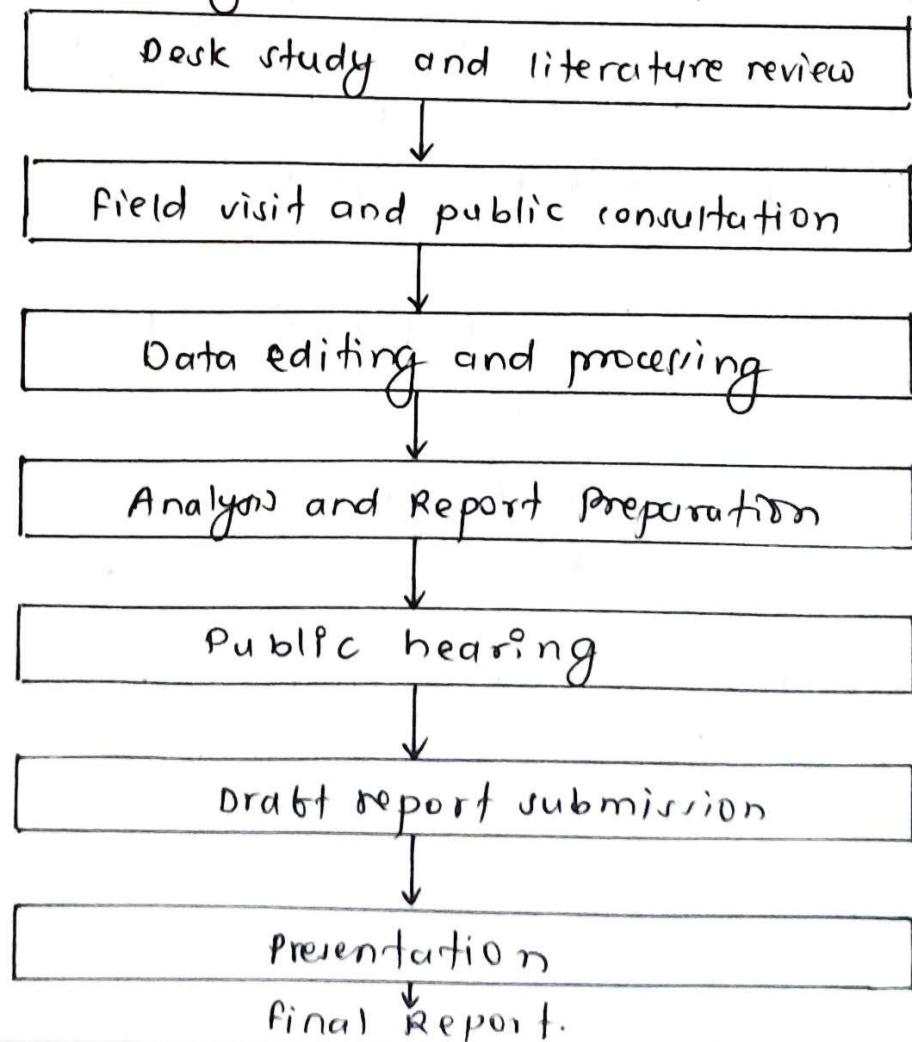
# Government rules, regulation and procedures for SEE in Nepal:

### \* Initial Environmental Examination (IEE):

- ↳ IEE is an analytical study or evaluation to ascertain whether implementing a proposal have significant impact on environment or not.
- ↳ IEE uses rapid and qualitative technique to find potential impacts without a large input of resources.
- ↳ It does not need to undergo scoping process.
- ↳ Uses checklist and matrix technique for impact identification.
- ↳ Consider alternatives to improve the environmental benefits.
- ↳ Identifies measures to mitigate adverse impacts.

### Methodology:

- ↳ IEE is guided by EPA/EPR and approved by TOR.

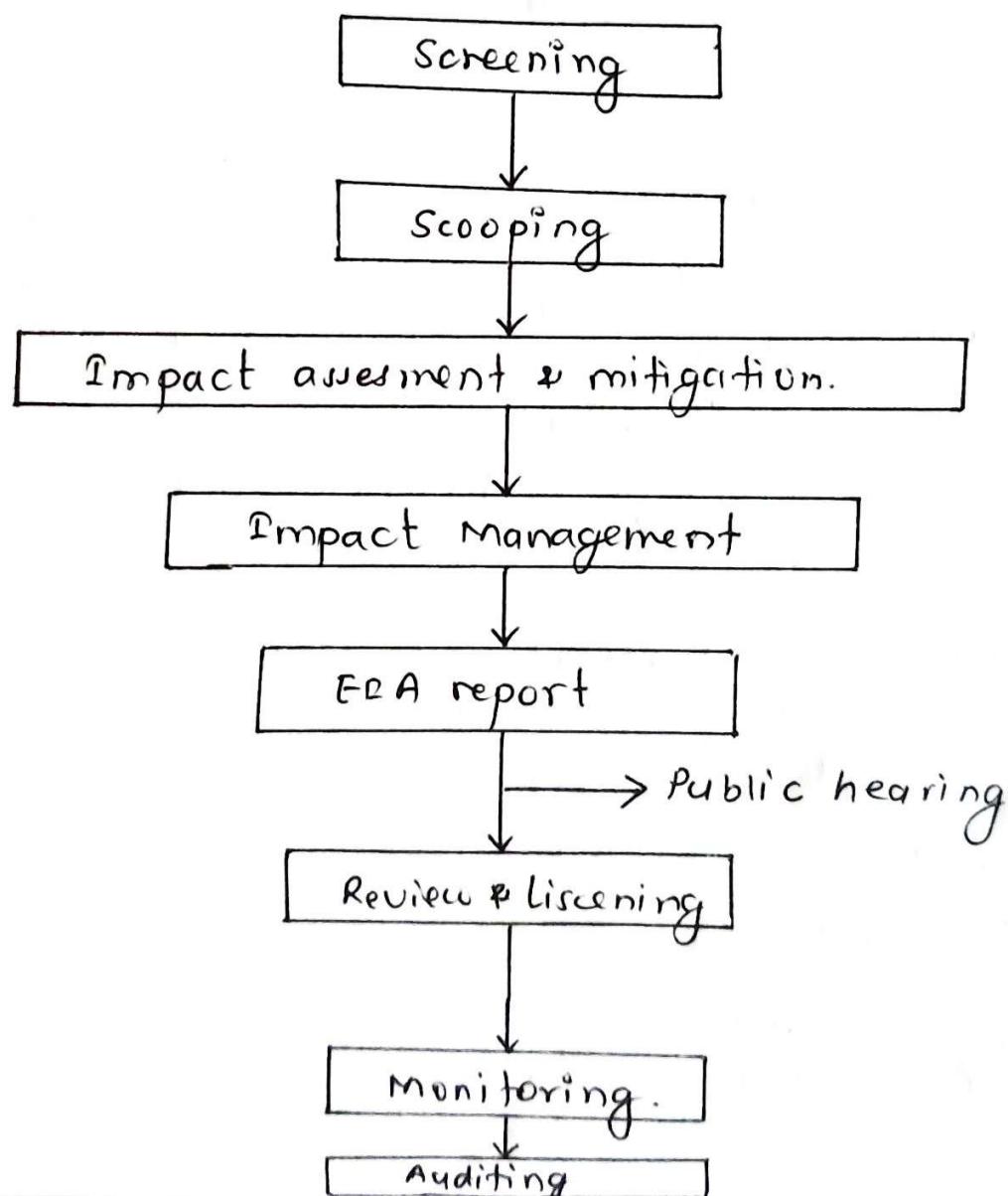


Parameters	Objective:
a. Desk study and literature review.	<ul style="list-style-type: none"> <li>↳ familiar with policies, regulation and guidelines.</li> <li>↳ project description and DPR</li> <li>↳ Information on setting of projects</li> <li>↳ TOR preparation and submission</li> </ul>
b. Field visit and public consultation	<ul style="list-style-type: none"> <li>↳ Review and concern of public about project.</li> </ul>
c. Data editing and processing.	<ul style="list-style-type: none"> <li>↳ editing, classifying, entry and processing.</li> </ul>
d. Analysis and Report preparation.	<ul style="list-style-type: none"> <li>↳ environmental impact identification</li> <li>↳ alternative analysis.</li> <li>↳ mitigation measures (preventive, curative, compensating)</li> <li>↳ monitoring plan.</li> </ul>
e. Public hearing.	<ul style="list-style-type: none"> <li>↳ Review of public on project.</li> </ul>
f. Draft report submission	<ul style="list-style-type: none"> <li>↳ submit the drafted report.</li> </ul>
g. Presentation.	<ul style="list-style-type: none"> <li>↳ gives information to concerned authority</li> </ul>
h. Final report.	<ul style="list-style-type: none"> <li>↳ submission of report to concerned authority.</li> </ul>

## \* Environmental Impact Assessment (EIA):

- ↳ EIA is a detailed study or evaluation to be made to ascertain whether implementing a project have significant effect on environment or not.
- ↳ EIA makes sure the decision makers about the likely effects on environment at earliest possible time and aim to avoid or reduce the effects.
- ↳ Proposals are understood properly, before decisions are made.
- ↳ Long term aim of EIA is to promote sustainable development.

## Methodology:



Parameters	Objective:
a. Screening	<ul style="list-style-type: none"> <li>↳ Determines whether a project requires EIA or IFE.</li> </ul>
b. Scoping	<ul style="list-style-type: none"> <li>↳ identifies the issues which are likely to be more important during EIA.</li> <li>↳ establishes what EIA will include.</li> </ul>
c. Impact assessment and mitigation.	<ul style="list-style-type: none"> <li>↳ identify the environmental and social impacts of planned projects.</li> <li>↳ prevent or minimize the impacts of planned projects.</li> <li>↳ evaluate according to environmental, social and cultural characteristics of area.</li> <li>↳ done by experts to assess diverse environmental and social impacts.</li> </ul>
d. Impact management	<ul style="list-style-type: none"> <li>↳ to identify number of changes in project design, implementation and closure etc.</li> <li>↳ series of plans and protocols prepared to manage and monitor risks.</li> </ul>
e. EIA report	<ul style="list-style-type: none"> <li>↳ EIA report and development activities must be published.</li> <li>↳ interested parties and public gives review on it.</li> </ul>
f. Review and licensing	<ul style="list-style-type: none"> <li>↳ designated authority review EIA report.</li> <li>↳ determine planned project will get licence or not.</li> </ul>
g. Monitoring	<ul style="list-style-type: none"> <li>↳ Ensures mitigation measures, priorities listed in EMP and contingency plans are properly implemented.</li> </ul>

Q. The term climate change and sustainable development is burning issues these days. Explain how EIA has come forward as an effective tool to tackle these issues. What is the role of EIA in sustainable development. (10 marks)

Ans: EIA has emerged as a vital tool in addressing the burning issues such as sustainable development and climate change. EIA systematically evaluates the potential environmental consequences of proposed projects, policies or activities. This assessment process enables decision making makers to make forward choices that minimize negative impact on the environment and promote sustainability.

- ↳ In the context of climate change, EIA helps to identify and mitigate activities that could contribute to green house gases. By assessing the carbon footprints and potential impacts on ecosystems, water resources and air quality, EIA ensures that project align with climate goals and promotes low-carbon alternatives.
- ↳ Regarding the sustainable developments, EIA contributes by considering the social, economic and environmental aspects of a project. It encourages adoption of green technologies, renewable energy sources and efficient resource management.
- ↳ EIA also fosters public participation, allowing locals communities and stakeholder to voice concerns and contribute to decision making process.

In summary, EIA serve as a crucial instrument to tackle climate change and advance sustainable development by promoting

- ① responsible decision making
- ② reducing environmental impacts.
- ③ fostering a holistic approach to development.

The role of EIA in sustainable development are significant. Some of its roles are:

- ① Identifying environmental impacts.
- ② Promoting sustainable practices.
- ③ Incorporates social considerations.
- ④ Mitigating negative impacts.
- ⑤ Enhancing decision making.
- ⑥ Ensuring compliance and accountability.

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- Q. What is scoping? Write the features of EPA-2076.  
What is climate change. Write the differences between BES, LFE and EIA on the basis of EPA-2019 and EPR-2020? [10 marks]

Ans: Scoping:

- ↳ The process of identifying and defining the key issues and impacts to be considered in EIA is called scoping.
- ↳ Scoping is done to determine scope of EIA study.
- ↳ It helps in developing and selecting alternatives.
- ↳ Scoping is done according to rule-4 of EPR-2020.

Features of EPA-2076:

- ① section-3 of EPA-2076 has provision for conducting three levels of environmental study:
  - a. BES
  - b. LFE
  - c. EIA
- ② section-12 of EPA-2076 has provision for environmental examination after completion and operation of projects by MofE or appointed authority.
- ③ It has provision for approval and implementation of environmental study to provincial/local levels.

- ⑩ It has provision for environmental protection area.
- ⑪ It has increased the fine with respect to previous act.

- EPA - 2054 : 100000 ← threshold
- EPA - 2076 : 3,00,000

Differences between BES, IEE and ECA on the basis of  
EPA - 2019 and EPR - 2020 are:

a. Brien Environmental study (BES):

Q. What are the advantages of EIA? What are the roles of EIA?

Ans: Advantages of EIA are:

- ① Reduced cost and time for project implementation.
- ② Cost saving modification in project design.
- ③ Increased project acceptance.
- ④ Avoids impacts and violations of laws and regulations.
- ⑤ Improved project performance.
- ⑥ Avoids treatments / clean up costs.

Roles of EIA:

↳ Different roles of EIA are:

- ① Legal role.
- ② Educational role
- ③ Policy making role.
- ④ Environmental role.

(i) Legal role:

↳ ensures development projects has a minimal impact on environment during its entire lifecycle i.e. during design, construction, use maintenance and demolition.

(ii) Educational role:

- ↳ Educates every professionals and users.
- ↳ aware about the effects of our action on environment.
- ↳ aware about delicate choices to be made considering social and environmental impacts.

### (iii) Policy making role:

- ↳ helps to judge the potential threats or natural hazard so that policy should be made towards sustainability of development and mitigation of hazards or threats.

### Q. What are the roles of EIA in sustainable development?

Ans: The roles of EIA in sustainable development are significant. Some of its roles are:

- ① Identifying environmental impacts.
- ② Promoting sustainable practices.
- ③ Incorporates social consideration.
- ④ Mitigating the negative impacts.
- ⑤ Enhancing decision making.
- ⑥ Ensuring the compliance and accountability.

---- continue previous questions:

### (iv) Environmental role:

- ↳ identifies the potential impact.
- ↳ examine significance of environmental implications.
- ↳ assess whether impact can be mitigated or not.
- ↳ recommend preventive and corrective mitigations.
- ↳ improves design of new development.

a. Differentiate between EIA and IEE: (5 marks)

S.N.	IEE	S.N.	EIA
①	scooping report is not required.	①	scooping report should be prepared.
②	Generally done for small projects.	②	conducted for large scale projects.
③	Environment monitoring plan is not required.	③	Environment monitoring Plan is required
④	short time	④	long time
⑤	less costly	⑤	more costly than IEE.
⑥	Policies and laws need not to be reviewed.	⑥	Policies, laws and connection may be reviewed if necessary.
⑦	Auditing is not required.	⑦	Auditing is compulsory.
⑧	Scope area is narrow.	⑧	Scope area is wider.
⑨	15 days notice in newspaper and deed of public notice needed.	⑨	Public hearing is required.
⑩	IEE: concerned agency in 21 days.	⑩	EIA: MOST within 90 days.

## 5.3.5 solid waste management, types and characteristics of solid waste:

- ↳ solid waste are the dry waste matters produced in the community and may be organic and inorganic as well as combustible or non-combustible.
- ↳ solid waste management is the process of collecting, treating and disposing of solid materials (wastes) to maintain hygienic condition.

### Types and characteristics of solid wastes:

- I. Municipal wastes
- II. Industrial wastes
- III. Hazardous wastes

#### I. Municipal wastes:

- ↳ wastes produced due to domestic use in the municipality are municipal wastes.

##### Municipal wastes includes:

- |            |  |
|------------|--|
| a. Garbage | d. Demolition and construction wastes. |
| b. Ashes   | e. Treatment plant wastes.             |
| c. Rubbish | f. Special wastes.                     |

#### II. Industrial wastes:

- ↳ wastes arising from industrial activities.

- ↳ includes rubbish, ashes, construction wastes etc

#### III. Hazardous wastes:

- ↳ wastes that pose a substantial danger immediately.

- ↳ Hazardous wastes can be grouped into:

- a. Radioactive substances
- b. Chemicals
- c. Biological wastes
- d. Flammable wastes
- e. Explosive.

### 5.3.7 Methods of solid waste disposal:

↳ Various methods of solid waste disposal are:

1. Dumping
2. sanitary land filling
3. Incineration
4. composting

#### 1. Dumping:

- ↳ throwing away of waste to till uncovered low laying areas.
- ↳ waste without garbage is thrown so that no nuisance is produced.
- ↳ very common in developing country.
- ↳ cheaper in construction and unhygienic.

#### 2. sanitary land filling.

- ↳ suitable if sufficient land is available and applied in urban area.
- ↳ a pit is dug and layer of solid waste is scattered
- ↳ dumping is done in layers of 1 to 2m, compacted by roller and covered by good earth.

#### Advantages:

- i. simple and no costly plant required.
- ii. separation of waste is not needed.
- iii. no residue left for further disposal.
- iv. pits of low laying lands are reclaimed.

#### Disadvantages:

- i. Requires more land.
- ii. creates foul gases nuisance.
- iii. leachate formed may pollute surface & ground water.
- iv. loss of recyclable waste.

### 3. Incineration:

- ↳ most hygienic method
- ↳ combustible wastes are burnt in incinerator.
- ↳ smoke produced is released to atmosphere
- ↳ Ash produced may be disposed off by sanitary land filling.

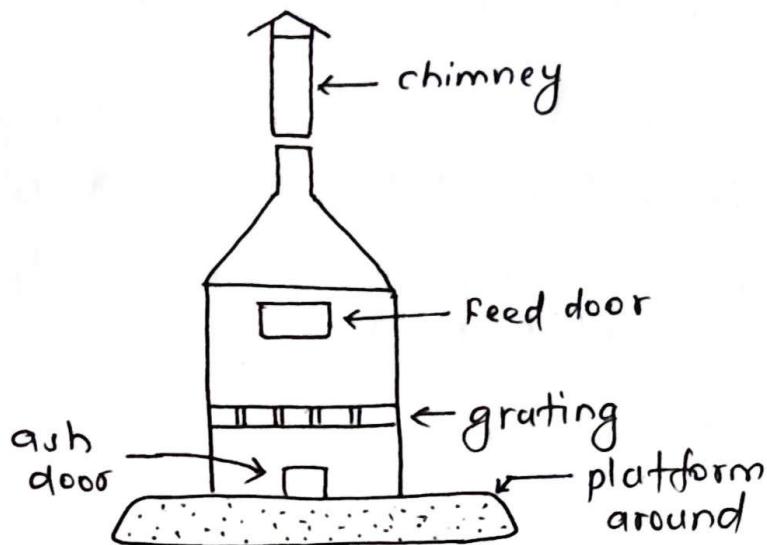


fig: incinerator.

#### Advantages:

- ↳ hygienic method
- ↳ destroy pathogens
- ↳ no odour and dust nuisance.
- ↳ lesser space requirement.
- ↳ produced clinker may be used in road construction.

#### Disadvantages:

- ↳ improper incineration may cause air pollution.
- ↳ initial investment is high.

### 4. Composting:

- ↳ suitable for putrefiable organic matters present in solid wastes which are disposed aerobically or anaerobically.
- ↳ converts into humus rich in nitrogen and stable minerals compound.

↳ Composting is the bacterial decomposition process to stabilize organic wastes and produce compost.

#### \*! Methods of composting:

- a. composting by trenching.
- b. open windrow composting.
- c. mechanical composting.

### 5.3.4 Green house effects, impacts and remedial measures:

↳ Green house effect is defined as change in climate that is attributed directly or indirectly to human activity, altering the composition of global atmosphere.

↳ Green house gases are

- $\text{CO}_2$
- $\text{CH}_4$
- $\text{NO}$
- Fluorinated gases etc.

#### Effects of green house gases:

- a. change in rainfall pattern.
- b. depletion of arctic ice.
- c. wild fires.
- d. heat waves.
- e. loss of wildlife species.
- f. rise in sea-level.
- g. shifting habitat.
- h. high temperature.

#### Mitigation measures of green house:

- i. use of no carbon technology.
- ii. energy conservation.
- iii. use of renewable source of energy.
- iv. expand deep lake water cooling.
- v. improve vehicle fuel efficiency.

### 5.3.1 Air pollution, causes and effects:

→ Air pollution refers to the presence of harmful substances such as dust, smoke, dirt etc in air which has negative impacts on human health.

#### Causes/sources:

- I. Burning of fossil fuel.
- II. Agricultural activities.
- III. Exhaust from factories and industries
- IV. Mining operations.
- V. Indoor air pollution.
- VI. Deforestation.

#### Impact of air pollution:

- I. Respiratory and heart problems.
- II. Global warming
- III. Acid rain
- IV. Eutrophication.
- V. Effect on wildlife.

#### Mitigation measures of air pollution:

- I. Decrease use of fossil fuel.
- II. Control of particulate pollutants in industries.
- III. Control of pollutants from agricultural activities.
- IV. Implementing concept of reuse, reduce, recycle.
- V. Use of public transportation
- VI. Emphasis on clean energy resources.
- VII. Energy conservation.
- VIII. Air quality legislation and standards.

## # Recharge of Ground Water and Ground Water Recovery: (PPSC - Bihar Province) (10 marks)

- ↳ Ground water recharge is a hydraulic process where water moves downward from surface to ground.
- ↳ Ground water recharge is a primary process through which water enters an aquifer.
- ↳ Ground water recharge generally occurs in vadose zone below the plant's roots.
- ↳ Ground water recharge occurs both naturally and artificially!

### (i) Natural ground water recharge:

- ↳ Natural ground water recharge is a process where water enters inside the soils through voids.
- ↳ Ground is recharged naturally through:
  - ① Precipitation i.e. rainfall and snowmelt.
  - ② to small extent by surface water.

### (ii) Artificial ground water recharge:

- ↳ Artificial ground water recharge is a process where water is induced into the ground artificially.
- ↳ Methods of artificial ground water recharge can be classified into three types:

## Artificial GW Recharge methods:



### Spreading Method

- a. flooding method
- b. Basin method
- c. Field pit method
- d. Ponding method
- e. check dams method
- f. Artificial channel method
- g. Natural channel method.

### Injection method

- a. wells
- b. Borehole
- c. Galleries

### Induced recharge method.

- a. pumping method.

#### 1. Spreading method:

- ↳ water is spread over land surface (permeable)
- ↳ water infiltrates directly to shallow aquifer.
- ↳ Rate of recharging depends on permeability of spreaded area.

#### 2. Injection method:

- ↳ water is injected into well to percolate into the ground.

##### Advantages:

- recharge rate is high.
- small area required for recharge.
- deep aquifers can also be recharged.