
UNIT 5 IMPACT ASSESSMENT

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5.1 INTRODUCTION

Population explosion, unplanned urbanisation and indiscriminate industrialization are responsible for increased pollution and environmental degradation. Pollution prevention is possible by proper environment protection management – which may include use of appropriate technology in industrial processes, use of less polluting raw materials – good housekeeping, social responsibility on the part of industrialists, general public awareness through public media like radio and TV, and programmes launched by Non-Governmental Organisations at rural level. However, it is experienced that such measures by themselves alone do not yield the desired results and pollution goes on increasing in various parts of the world at global level as well. Perhaps the most effective way for preventing pollution lies in not only enacting laws but enforcing them strictly to punish the culprits for violating the laws.

Various Acts stand passed in this regard by the Government even prior to independence. There is also a provision in the Indian constitution for preventing pollution. The important Act, in this regard, passed by the parliament after independence are briefly described in this unit.

Objectives

At the end of this unit, you should be able to

- comprehend the implications of Water Pollution Act, 1974; Air Pollution Act, 1981; and Environmental Act, 1986,
- appreciate the significance of Environmental Impact Statement (EIS), and Environmental Impact Assessment (EIA), and
- understand the basics of the process of environmental appraisal of the concerned project.

5.2 THE WATER ACT, 1974

Water (Prevention and Control of Pollution) Act, 1974. (No. 6 of 1974).

This is an Act that provides for the prevention and control of water pollution, and the maintenance and restoration of water supplies whenever necessary. It also provides for the establishment of institutions (boards, etc.) with a view to carrying out the prevention and control of water pollution – conferring on and assigning to such boards, powers and functions as are required in this regard.

There are in all eight chapters in this Act.

Provisions

A skeleton outline of the eight chapters contained in the Act is presented as under :

Chapter I, (Preliminary)

This chapter mainly gives definitions of the terms used in the Act.

Chapter II

This chapter lays down the outline of the establishment of the central and state boards for prevention and control of water pollution. As per Section 3 of this chapter, the constitution of the Central Board has been described; and Section 4 gives the constitution of State Boards.

Chapter III, (Joint Boards)

Section 13 and 14 give the constitution and composition of joint boards.

Chapter IV, (Powers and Function of Boards)

Section 16 describes the functions of Central Board. This section is important to environmental engineers.

Section 17 describes functions of the State Boards. The functions of the State Board are very vital and important.

Chapter V, (Prevention and Control of Water Pollution)

It has several sections outlined as under :

Section 19 of this chapter describes the power of State Government to restrict the applications of the Act to certain areas only whenever necessary.

Section 20 describes power to obtain information by surveying or by stream gauging.

Section 21 gives powers to take samples of effluents, and lays down the procedure to be followed in this connection.

Section 24 is related to prohibiting the use of a stream or a well for the dispersal of polluting matter, etc. into these water bodies.

Section 25 restricts a person so as not to establish new outlets and new discharge points without the previous consent of the State Board.

Section 27 makes the provision for refusal or withdrawal of consent by the State Board.

Section 32 gives the details of the emergency powers of the State Board to take suitable measures in case of pollution taking place in a stream or well.

Chapter VI, (Funds, Accounts and Audit)

The provisions relate to the smooth and efficient administration of the Boards.

Chapter VII, (Penalties and Procedure)

Section 42 relates to penalty for certain prohibited acts.

Section 43 gives the penalty for the contravention of provisions of section 24.

Section 44 includes penalty for contravention of certain other provisions of the Act as a whole.

Sections 47 and 48 relate to the offences committed by companies and Government Departments.

Chapter VIII, (Miscellaneous)

This chapter describes functions of the Central Water Laboratory, State Water Laboratory, annual reports; and, the power of Central Government to supersede Central Board, power of State Government to supersede the State Board; and, outlines powers of Central and State Governments to make rules.

5.3 THE AIR ACT, 1981

Air (Prevention and Control of Pollution) Act, 1981. (No. 14 of 1981)

It is an Act that provides for the prevention, and control of air pollution, and for the establishment of Boards, with a view to carrying out the aforesaid purposes. The Act also provides for assigning and conferring necessary functions and powers, respectively, to these Boards. This Act consists of seven chapters.

Provisions

Chapter I (Preliminary)

This chapter defines the various terms used in the Act.

Chapter II (Central and State Boards for the Prevention and Control of Air Pollution)

This chapter lays down the constitution of these Boards.

Chapter III (Powers and Functions of Boards)

Section 16, is related to the functions of Central Board.

Section 17, gives the functions of State Boards.

Chapter IV (Prevention and Control of Air Pollution)

Section 19, empowers the authorities to declare air pollution control areas.

Section 21 (as added by Act 47 of 1987) outlines restrictions on the use of certain industrial plants.

Section 22, prohibits the emission of air pollutants in excess of the standards laid down by the concerned State Board.

Section 22 A (added by Act 47 of 1987) gives power to the Board to make applications to the appropriate court for restraining persons from carrying out air pollution activities.

Section 24, relates to the power of entry into and inspection of a place, etc., by a person empowered by a State Board; whereas Section 25 gives power to obtain information.

Section 31 A (inserted by Act 47 of 1987) gives power for giving discretion to the Board to close, prohibit or regulate any industry; it also empowers the Board to stop or regulate the supply of electricity, or handle any other service in a similar manner.

Chapter V, (Funding, Accounts and Audit)

This chapter discusses the budgetary provisions and related issues.

Chapter VI, (Penalties and Procedures)

Section 37, 38 and 39 discuss the penalties for failure to comply with the provisions of Section 21, 22 or 31 A, and penalties for certain acts, and for the contravention of certain provisions of the Act.

Chapter VII, (Miscellaneous)

The chapter discusses the powers of State Government to supersede the State Board; special provision to supersede Central Board or the State Boards constituted under Water (Prevention and Control of Pollution) Act, 1974, and powers of Central Government and State Government to make rules.

5.4 THE ENVIRONMENT ACT, 1986

Environment (Protection) Act, 1986. (No 29 of 1986).

It is an Act (based on four chapters) that provides for the protection and improvement of environment, and the related matters.

Chapter I, (Preliminary)

This chapter gives the short title of the Act, and details of the extent and commencement of pollution, hazardous substances etc.

Section 2 of the chapter, defines environment, environmental pollutants, environmental pollution, hazardous substances, etc.

The Act has a broader spectrum and includes water, air and land and their inter-relationship which exists among and between water, air and land and human beings, other living creatures, plants, micro-organisms and property.

Chapter II, (General Powers of the Central Government)

Section 3 is related to the power of Central Government to take measures for the protection and improvement of environment.

Section 4 and 5, discuss the appointment of officers, their powers and functions and power to give directions.

Section 6 is very important as in accordance with this section, Central Government may by modification in the official Gazette, make rules in respect of all or any of the matters referred to in Section 3.

Chapter III, (Prevention, Control and Abatement of Environmental Pollution)

Section 15, is related to the penalty to be imposed for contravention of the provisions of the Act, and the rules, orders and directions issued from time to time.

For failure to comply with or contravening any of the provisions of the Act attracts the punitive clauses; for each failure or contravention the punishment is imprisonment for a term which may extend to five years, or imposition of fine which may extend to one lakhs rupees, or both. If the failure or contravention continue even after this punishment is meted out, additional fine which may extend to five thousand rupees per day has been provided for. However, if failure or contravention continues beyond the period of one year after the date of conviction, imprisonment for a term extendable to seven years is proposed.

Chapter IV, (Miscellaneous)

This chapter makes a provision for any pollution caused due to any action taken in good faith, cognisance of offences, bar of jurisdiction, effect of other laws, etc.

As per the powers conferred by Section 6 and 25 of the Environment (Protection) Act, 1986 the Central Government has made the Environment Rules under modification No. S.O. 844 (E) of 19-11-86.

The Hazardous Wastes (management and handling) Rules 1989 under modification No. S.O. 594 (e) of 28-7-89 were also made by the Central Government with reference to Sections 6, 8 and 25 of the Environment (Protection) Act, 1986.

Similarly, the Rules for the Manufacture, Use, Import, Export and storage of hazardous microorganisms / generally engineered organisms or cells were made under modification No. G.S.R. 1037 (E) of 5-12-89 as per the provision made in the Environment (Protection) Act, 1986.

SAQ 1

- (a) Discuss the importance of laws in protecting environment.
- (b) Briefly describe the important provisions made in the following Acts :
 - (i) The Water Act, 1974.
 - (ii) The Air Act, 1981.
 - (iii) The Environment Act, 1986.
- (c) What is the significance of the Air Amendment Act, 1987 (No. 47 of 1987)?

5.5 ENVIRONMENTAL STATUS OF PROJECTS

Rapid industrialization has resulted in the environmental pollution threatening living organisms, and cultural assets in some parts of the world where industrialisation is equally essential to keep pace with developed nations. The only way to protect environment from being polluted is to take adequate measures while preparing the project proposals and implement the environmental management plan at different stages of project – planning, execution and operation.

Some of the problems related to environmental protection can be easily solved by selecting appropriate disposal sites and providing treatment facilities for the wastes generated from industrial processes. It should be remembered that small projects have little adverse impact on the environment as the pollution, if any, created by them is controlled by the natural assimilative capacity of the ambience.

It is obvious that any developmental project will have both positive as well as negative impacts. They should be precisely evaluated, and if the positive impacts outweigh the negative ones, the project can be accepted for execution, and appropriate measures to minimize the negative impacts can be taken.

River Valley Project

By constructing a dam across a given river a multipurpose river valley project takes its birth. There are, no doubt, many advantages available due to such major projects. Power generation, irrigation, water supply for municipal and industrial use, flood control, and creation of recreational opportunities are some of the vital advantages associated with them. The hydel power that becomes available is cheaper compared to thermal or nuclear power, irrigation facilities that develop can boost up the agricultural activities and, therefore, food production, and fishing industry. Safety of life and property against the ravages of flood will result in increased national income and improvement of socio-economic status of the beneficiaries of the project. However, the ill effects associated with these major projects can also be listed. Artificial reservoirs, in the first instance cause submergence upstream of the dam, dislodging people and submerging cultivated/cultivable land. The places of historical or archaeological importance may be required to be shifted, otherwise allowed to be lost under water. Moreover, mineral deposits, if any, are bound to be rendered unexploitable. The artificial water body that is created may bring climatic changes with the passage of time. Thermal stratification that develops in the lake may affect the flora and fauna and also the fish life.

5.6 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Environmental Impact Assessment (EIA) is a procedure used in any project planning-cum-management process with a view to predict the ensuing environmental consequences that may follow, and then to plan appropriate measures for reducing any adverse effects. It may be mentioned that EIA and EIS (Environmental Impact Statement) are expressions used interchangeably in environmental engineering.

Any development project, like, developing agriculture, using natural resources, industrialisation, or infrastructural development has a potential to cause undue adverse environmental impact as a result of improper location, inappropriate design, unplanned construction, unskilled and faulty operation and maintenance, or the ignorant misuse of existing natural resources. The projects may lead to the deterioration of water quality (leading to loss of flora and fauna), build-up of green-house gases, depletion of ozone layer, degradation of quality of air, and affect adversely the landscape and built-up environment – thus, impinging on these major determinants of health and well being.

It is obvious that the basic purpose of the EIA is to identify environmental hazards as well as specify necessary Environmental Protection Measures (EPM) – in other words, Environmental Management Plan (EMP) – which will address measures needed to mitigate the expected adverse effects, offsetting unforeseen impact, and enhancing environment through technical and institutional procedures.

For the preparation of EIA (or EIS), first of all *environmental inventory* needs to be framed. This encompasses a comprehensive description of the prevailing physical environment. Secondly, an analysis of potential adverse impact, due to the coming up of a given project, and placement of its each component in appropriate perspective. In many assessments, it is useful as well imperative to measure and project all facts of qualitative environmental impact in quantitative (or numerical) terms with a view to optimising the gamut of efforts directed at achieving best results.

Though the format of the EIS can vary to some degree, depending upon the type of emphasis to be laid on any particular aspect, it always, to summarise, discusses the following topics :

- (i) Description of the existing environment;
- (ii) Description of the proposed project;
- (iii) Identifying and analysing possible direct adverse environmental consequences;
- (iv) Identifying unavoidable adverse effects;

- (v) Identifying indirect (i.e., secondary) impacts;
- (vi) Overall strategy (methods) to reduce the adverse impacts as far as possible;
- (vii) Outlining the alternatives to the proposed project;
- (viii) Identifying the sure availability of energy and resources; and
- (ix) Estimating the extent of public input, and any review that would be necessary.

The EIS is supposed to be an objective, unbiased study. Any manipulation by the interested quarters to promote or stop a project, vitiates the very purpose of such a study.

Appraisal of Existing Environment

The inventory of existing natural and artificial resources in the neighbourhood of the project may include the following aspects :

Geology, Soil and Topography

This would describe the types of bed rock, soil types, and existing topography. Potential for any soil erosion, expected percolation rates, depth to ground water, and the location of recharge surfaces of the existing aquifers will also be covered under this head.

Water Resources

Streams, lakes, in and around the site; ground and surface water quality; drainage pattern; flood hazards; and stream flow rates, etc. would be studied that exist at the pre-developmental stage.

Flora and Fauna

The extent and type of wood lands, etc., available would be documented. Species of animals that use the site as their habitat would be identified. Such types of data are usually presented pictorially (Figure 5.1) for the sake of clarity and ready reference.

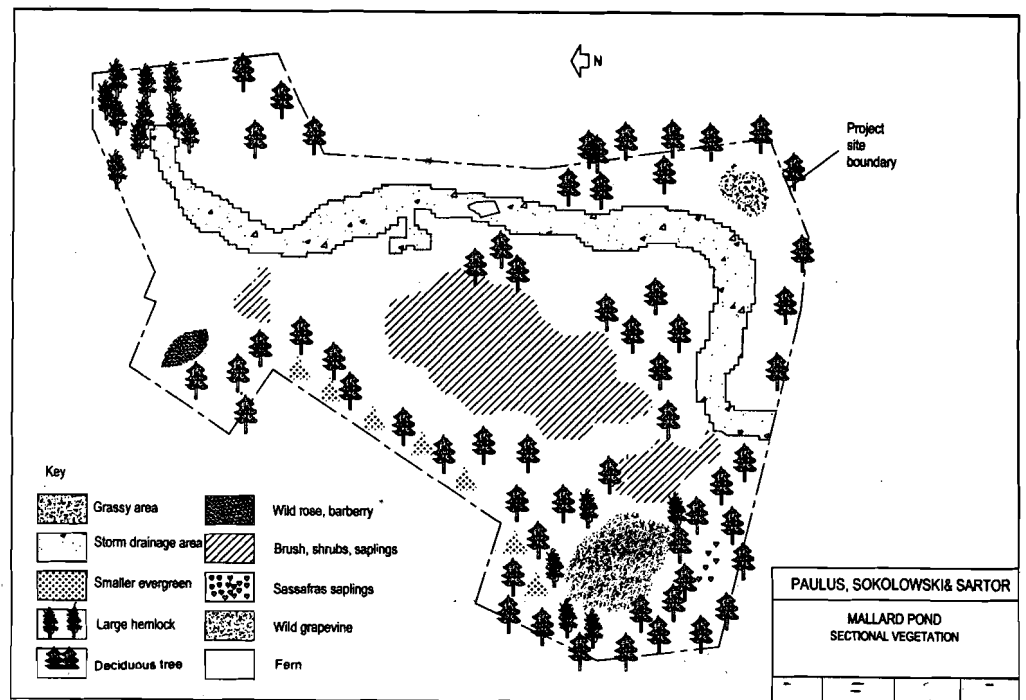


Figure 5.1: A Pictorial (Graphical) Map Showing Prevailing Flora at a given Site

Air Quality and Noise

Quality of ambient air, local meteorological conditions, noise levels and frequencies, etc. have to be assessed.

Transportation

Modes of existing transport systems, local traffic volumes and patterns, existing roadway capacities would be evaluated.

Public Utilities

Their description includes location and capacities of relevant water supply and sewerage systems; gas, telephone, electric and refuse collection services in the area of interest. Their evaluation is of immediate relevance.

Population, Land Use, and Socioeconomics

It is, obviously, essential that the prevailing population densities and land-use patterns are described in detail. This survey must include residential, commercial, industrial, and agricultural lands. Moreover, local incomes-cum-economic level and tax base should also find a place under this heading. The intended usefulness of the report demands the inclusion of details about schools, and such items as fire and police services as well.

Historical and Prominent Cultural Landmarks

The possibility of any archaeological sites existing within the project area has to be investigated. Therefore, their locations have to be mapped out. Moreover, the location of museums or libraries (if any) would be described. Further, any unique aesthetic features, such as, beautiful views, etc., have also to be identified.

To sum up, an EIA, vis-a-vis, a proposed project must cover the following aspects of environment :

- (a) Meteorology and air quality;
- (b) Liquid effluents, and air pollution;
- (c) Noise and vibration;
- (d) Social wastes;
- (e) Occupational safety and health;
- (f) Prevention, maintenance, and operation of environmental control systems;
- (g) House-keeping;
- (h) Human settlement;
- (i) Cultural aspects;
- (j) Transport systems;
- (k) Vegetal cover;
- (l) Disaster planning;
- (m) Environmental management mechanism.

It is appropriate to gather necessary information for this report (for a comprehensive appraisal) using a questionnaire. A typical questionnaire, regarding an industrial project, may ask for the following data :

- (1) Name, address, and details about the proprietor of the industry; and the type of the project.
- (2) Process details –
 - (a) Raw materials, and mode of consumption
 - (b) Products, including quantity of production
 - (c) Manufacturing process
 - (d) Type of energy required and amount of its consumption.
- (3) Existing conditions –
 - (a) Site, and index, map of the surrounding area
 - (b) Area acquired for the project, including township (with gardens and other facilities) – with a detailed outlet
 - (c) Present land-use pattern.

- (4) Meteorology of the local area –
 - (a) Wind rise diagram
 - (b) Rainfall statistics
 - (c) Temperature and humidity profiles.
- (5) Socio-economic condition of the people living in and around the area, which should indicate the availability of skilled, semi-skilled as well as the unskilled labour, and other categories.
- (6) Water requirements

This aspect should bring out the water requirements of plants, people, and for the running of the project itself. Moreover, the sources(s), quality and quantity of the available water have to be outlined. Therefore, the treatment of water, if any, has to be evaluated in terms of cost involved.
- (7) Details about waste water –
 - (a) Quality and quantity of waste water expected from industry and its residential sector
 - (b) Mode of treatment, its cost, and possible mode of disposal.
- (8) Generation of solid waste –
 - (a) Quality and composition
 - (b) Treatment and /or disposal (with details of the proposed site)
 - (c) Details of the site for solid waste disposal and its combustion
 - (d) Cost of analysis.
- (9) Parameters of atmospheric pollution –
 - (a) States of ambient atmosphere
 - (b) Sources of air pollution
 - (c) Types, quality and quantity of pollutants
 - (d) Measures necessary for the control of pollution, etc.
- (10) Environmental monitoring systems –
 - (a) Monitoring programmes, procedures and format for data presentation
 - (b) Instrumentation for the control of environmental pollution – air, water, and land.
- (11) Safety programmes for industrial works –
 - (a) Health and hygiene
 - (b) Safety procedures during work
 - (c) Appropriate, safe handling of hazardous (if any) or toxic wastes
 - (d) Social amenities and facilities for workers and families.

Types of Impact and Other Aspects

It is pertinent to distinguish between short-term impacts and long-term impacts with a view to put future concerns in perspective. For instance, the effects of any construction activity might include a temporary increase in the neighbourhood noise level due to the working of heavy machinery. But, once the project is completed these disturbances cease to exist – hence, such effects can be considered as short-term ones. However, the effects, if any, on runoff pattern and on local aquifer recharge rates would not disappear after construction is over; and, as such these impacts would be taken as long-term impacts.

Broadly speaking, procedures for assessing impacts, can be grouped into two categories :

Checklist methods, and more complex matrix methods. In the checklist method, all potential environmental impacts for the various project alternatives are listed, and the anticipated magnitude of each impact is described qualitatively. Negative impacts may be indicated with minus signs – a small or moderate impact could be shown with, say, two minus signs (--), whereas a relatively more severe one could be assigned three or four minus signs (---). Similarly, beneficial (or positive) effects can be assigned plus (+)

signs. Obviously, if any environmental impact is not applicable, vis-a-vis, a given project alternative, a zero (0) would indicate the same. Such a list would serve to present a visual overview of the assessment.

In the matrix method, the procedure is aimed at quantifying (i.e., giving grades) the relative impacts of the project alternatives, and thus providing a numerical basis for comparison and evaluation. The anticipated magnitude of each potential effect may be rated on a scale of, say 0 to 10 – the higher numbers may represent severe adverse effects, and the lower numbers represent minor or negligible effects – zero (0) would, thus, indicate no expected impact for a particular environmental component.

Numerical weighting factors can also be introduced in the matrix procedure to incorporate the relative importance of a given impact. These weighting factors have to be designed after due thought, and would, obviously be site and project specific. For instance, the impact on ground water quality may be taken as more important in a particular area than effect on the quality of air, if this water is the sole source of potable water. Obviously, these weighting factors can be multiplied by the respective magnitudes (of the impacts), in order to put each impact in perspective. The sum total of all these weighted impacts gives a composite score known as *environmental quality index* – a specific parameter of each project alternative. As per the logic given above, the alternative with the lowest index would be the one that can cause the least harmful overall environmental impact.

These assessments help to visualise any mitigating measures that would be necessary while adopting the best possible alternative project design. The measures may take the form of some changes in the project design. For example, if soil erosion is expected to increase (increasing sedimentation in local streams – leading to the degradation of surface water quality), growing grass / trees, etc. on the catchment can constitute the mitigating measures in this case. Another example of a mitigating measure would be to relocate the facilities (to be constructed on the site), if possible, to preserve valuable trees, or other type of vegetal cover. It may again be stressed that one has always to accept unavoidable adverse impacts in preference to no-project (or no-action) alternative.

It is desirable that an EIS report includes an evaluation of possible secondary (or indirect) impacts as well – impacts that would be caused by the implementation of a project. Secondary effects are those that are not immediately apparent, and are not directly caused by the launching of the project, and perhaps would not occur if the project were not built at all.

A complete EIS would include a response to public opinion and input. Review of the report on the basis of the feedback from citizens and public interest groups must follow the insurance of a draft EIS. This allows the incorporation of suggestions that can otherwise be overlooked by the professionals preparing such reports.

As per press notes No. 10/60/83-LP of 21-6-84, and 10/60/83-LP of 10-12-84, Ministry of Industry, Government of India, there are certain industries which are highly polluting. Entrepreneurs are required to get the clearance from the director of industries of the concerned State and “no objection” certificate as well from the State Board with respect to pollution before starting any industry. Ministry of Environment and Forests, Department of Environment, Government of India, has published environmental guidelines for siting of an industry in August 1985. In this document the purpose of Environmental Impact Assessment (EIA) is given as “to identify and evaluate the potential impacts (beneficial and adverse) of development projects on the environmental system.” This is useful in taking appropriate decision based on environmental implications including social, cultural and aesthetic concerns that can be integrated with the analysis of the project costs and benefits.

SAQ 2

- (a) Describe in brief the positive and negative impacts of a river valley project.
- (b) Explain environmental impact assessment process.
- (c) Discuss the format for an environmental appraisal of a specific project near your area.

5.7 SUMMARY

Population explosion, unplanned urbanisation, and indiscriminate industrialisation are the main parameters that contribute to unmanageable pollution and environmental degradation. Therefore, proper environment protection management practices have to be followed.

Mere enacting laws does not have the desired effect in so far as the ever increasing menace of pollution is concerned, although the provisions of such laws are high sounding.

Some of the problems related to environmental protection can, however, be solved by scientific waste treatment and disposal procedures. Every big project has both beneficial and adverse impacts on the environment and ecology. With a view to assessing the nature and extent of all these impacts, one goes for the preparation of Environmental Impact Assessment (EIA) reports prior to launching a project. It is obvious that the basic purpose of an EIA (or EIS) is to identify environmental hazards as well as to specify necessary measures for the protection or minimisation of adverse effects. An EIA, therefore, begins with the description of existing status of the environment, and considers geology, flora, fauna, and all the relevant parameters that are pertinent.

Impacts may be short-term or long-term in their influence, or may be the offshoots of direct impacts (and, are called secondary impacts). Broadly speaking, procedures for assessing impacts can be grouped into two categories : checklist methods and matrix methods – all these help one to visualise the full panorama of impacts and these arrive quickly at the appropriate decisions.

It is the duty and social responsibility of every individual whether a common citizen or an industrialist to protect the environment from being polluted by these activities. The common experience is, however, quite contradictory. No one bothers about preventing environmental pollution. One of the measures that comes to mind, under these circumstances, is to enact appropriate environmental pollution laws; and our parliament has already enacted important environmental Acts.

5.8 ANSWERS TO SAQs

Refer to appropriate sections in the unit, and reference material.

FURTHER READING

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