BLOCK 3
ENVIRONMENTAL POLICY

INTRODUCTION TO BLOCK 3

Block 3 is on Environmental Policy. It has three units (Units 5, 6 and 7). **Unit 5** is on Command and Control Policy Approach. The unit first outlines the 'rationale for regulations'. The 'command and control (CAC) approach' is then described in terms of (i) types of environmental standards generally prescribed and (ii) the equi-marginal principle. The economics of 'enforcement of the CAC approach' is then described in terms of its advantages and disadvantages. The 'key issues' related to the CAC policy (viz. efficiency versus cost effectiveness and ambient-differentiated versus emission-differentiated regulations) are explained.

Unit 6 is on Market Based Instruments. The unit discusses concepts like: (i) pollution fees or Pigouvian tax, (ii) tradable emission permits, (iii) subsidies and refundable deposits, (iv) liability and (v) cost-effectiveness of emission trading.

Unit 7 is on Implementation of Environmental Policy. The units covers the areas of: (i) evolution of environmental policy, (ii) environmental Acts in India before 2000, (iii) environmental Acts in India post-2000 and (iv) issues of implementation.

UNIT 5 COMMAND AND CONTROL POLICY APPROACH*

Structure

5.0 OBJECTIVES

After reading this unit, you will be able to:

- discuss the theoretical rationale for regulations;
- outline the major 'types of regulation policies' in practice;
- specify the objectives of the 'command and control (CAC) policy' approach;
- explain the different types of quality standards prescribed under the CAC approach;
- state the concept of 'equi-marginal principle' indicating its feasibility to apply in real world;
- elucidate the economic rationale behind the enforcement of the CAC approach;
- enumerate the advantages and disadvantages of the CAC approach;
- differentiate between the characteristics of 'efficiency' and 'cost-effectiveness' under the CAC approach to environmental policy; and
- distinguish between the 'ambient differentiated' and 'emission differentiated' concepts of environmental regulation.

* Dr. Dipti Nayak and Prof. S. P. Singh, I. I. T. Roorkee.

5.1 INTRODUCTION

Human beings are performing many activities for the purposes of their survival, economic and material growth, safety, and security. These anthropogenic activities generate many negative externalities like production of waste or pollution. There is a limit of natural systems to absorb or assimilate different kinds of wastes and pollution produced out of these activities. When the wastes or pollution are produced beyond the nature's capacity to absorb and assimilate, they adversely impact on both human beings and natural systems. This gives rise to the need for government intervention for regulation. As pollution is a by-product of the economic production process, it is a must in every production system. Hence, the government tries to control pollution through different policy mechanisms and tools. These can be classified into two approaches: (i) command and control (CAC) approach and (ii) economic incentives (EIs). This unit describes the first approach of the environmental regulation, which, includes: (i) setting and enforcing emission standards and (ii) prescribing rules and regulations for the production process for controlling the generation of pollution.

5.2 RATIONALE FOR REGULATIONS

Environmental regulation is a relatively recent instance of economic regulation. Economic regulation relates to government intervention in the actions of firms and individuals, or in the working of the market, for optimal allocation of resources. These regulations are mostly backed by two basic theories of regulation viz. public interest theory and interest group theory.

According to the public interest theory, the purpose of regulation is to safeguard public interest by addressing the factors of: (i) imperfect competition, (ii) incomplete information and (iii) externalities. These three factors, commonly associated with market economy, necessitate government regulations and controls. The first rationale for regulation is to prevent concentration of market power by promoting competition among economic entities. For instance, in the absence of government regulations, individual units (e.g. sugar factory) may not treat their solid, liquid and gaseous wastes before releasing them into the environment. In order to internalise the negative externalities from such actions, the government can establish a set of regulations so that the polluters must bear the cost of such environmental bad products generated while producing goods and services. Sometimes, regulation is required to handle the case of a natural monopoly. In the case of natural monopoly, economic efficiency calls for a single firm because of its high start-up costs and unique nature of raw materials or technology used. For instance, electricity distribution company is an instance of natural monopoly (although, at present, due to the involvement of multiple companies in the power distribution in some Indian states, the instance of natural monopoly even here no longer universally exists). The role of the government, in the case of natural monopoly, is two fold: (i) to guarantee a monopoly to a particular firm by restricting the entry of new firms and (ii) to

control prices in order to protect consumers from monopolistic pricing. In addition, the role of the government is to (i) prevent undue concentration of market power, (ii) attempt to prevent collusion and (iii) restrict mergers that create monopoly power.

The second rationale for government regulation is in the context of imperfect information. Consumers do not get complete information before getting into a transaction. Hence, government needs to step-in to compensate the information gap. For instance, if problems occur in consuming a product, a firm can be held liable. If such liability rules are properly designed, they can induce the firm to provide an efficient level of safety. A government can directly intervene in the market by specifying acceptable standards of information on the quality of the product and to make it known to the consumers compulsorily. This would help consumer to make an informed choice.

The third rationale for government intervention is due to externalities. Because of the two characteristics of public goods (non-rivalry and non-excludability), markets are generally inefficient in providing public goods. Therefore, government intervention is necessary in the provision of public goods. In case of public bads, the approach on the part of the government is to define a set of standards and regulations so as to govern the generation of public bads (e.g. pollution) within limits set.

According to the interest group theory, regulation is required to protect the interest of specific groups or regions. For instance, in order to attract more private investment in clean energy generation, government can provide input subsidies and tax exemptions to promote the investment in alternative sources of energy like solar, wind or bio-energy. This theory maintains that rent-seeking is the primary rationale for regulation. Rent seeking involves private individuals and firms who could influence the government to guarantee an extra profit (or rent) through government-mandated restrictions on economic activity. For instance, in order to control emissions, Government of India has provided stubble management machinery to farmers of Punjab at a subsidised rate. However, the prices of these machines (like rotavator, happy seeder, chopper, super straw management system) have been hiked by manufacturers after the declaration of the subsidy packages. This would reduce the interest of the farmers but guarantee extra profit for the manufacturers. We can also consider the instance of crop insurance scheme where some insurance companies are favoured. These are instances of rent-seeking which means that the private bodies get extra profit through lobbying with the government in influencing the public policies beneficial to them.

Thus, the purpose of regulations is to remove instances of market failures by creating an enabling environment under which the market can work efficiently. For this purpose, in addition to instituting a set of legally binding rules and regulations, the state has to establish efficient institutions to implement them. The thrust of environmental regulation is that the government tries to induce a polluter to take socially desirable actions which are not in the interest of higher profits for the polluter. Again, it is true that the government may not always be able to precisely control pollution since it

invariably faces the complex problem of determining the level of pollution acceptable to the society. In such situations, the government faces pressure from consumers as well as producers. The interaction among the government bodies (executive, legislative and judiciary units), polluting firms and consumer-citizens are so complex that it requires regulatory institutions to be set up for determining and implementing standards.

5.2.1 Types of Regulations

Environmental regulations are broadly classified into two categories: (i) command and control (CAC) and Economic Incentives. Command and Control Approach (CCA) is a direction by the government in the way in which production and consumption activities are carried out. Aimed at controlling the environmental degradation, the government: (i) enacts rules and regulations, (ii) institute enforcement authorities at different levels to implement them and (iii) places a system of fine and penalties for dealing with cases of violation of the rules and regulations. Economic incentives (EIs), on the other hand, are indirect instruments which provide rewards for polluters to do what is perceived to be in public interest. Within EIs, there are four key instruments: (i) subsidies, (ii) pollution taxes/fees, (iii) marketable permits and (iv) liabilities (or damages). For instance, if the government wants to reduce emission level in the electricity generation, subsidies on inputs or outputs or both may be provided to the firms to encourage generating power through cleaner sources like solar or wind power plants. Simultaneously, government can impose more taxes or fees on the companies that use fossil fuels to generate power such as thermal power plants. Economic incentive (or disincentive) mechanisms can alter the investment decisions of business entities motivating them to innovate and adopt best practices to reduce emission per unit of output produced. More discussion on the economic incentives will be made in the next unit. The present unit focuses only on the CCA of the environmental policy.

Apart from these two constituents of environmental regulation, 'voluntary actions' have also become popular for environmental protection after the 1990s. A voluntary action is defined as an environmentally beneficial action by a firm or organisation that is not induced by applicable laws or regulation (either through regulatory requirements or substantial positive or negative incentives). There are two broad measures of voluntary actions. Firstly, actions that are purely motivated by market components like consumers, employees, competitors or investors. For instance, a firm may go green with a view to attracting more consumers or better employees or to improve its competitiveness in the industry or to get more investors. Secondly, this type of voluntary action requires the presence of a government regulator. It involves a strategic game between the firms and an environmental regulator. The regulator may be actively engaged with the firm or simply hovering in the wings. In both the cases, a firm may take voluntary action to improve its relationship with the regulator.

Check Your Progress 1 [answer within the space given in about 50-100 words]

1) Why is there a need for government intervention to regulate environmental degradation?

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2) State the underlying economic rationale for environmental regulation.

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3) What are the three functions performed by the government under the CCA?

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5.3 COMMAND AND CONTROL (CAC) APPROACH

Under the CAC approach, government enacts environmental laws and ordinances to: (i) regulate the production and consumption of certain activities, (ii) prompt people and business entities to bring about a behaviour considered socially desirable and (iii) ensure the compliance through enforcement mechanism (court, police, fines, etc). The CAC approach sets specific limits for pollution emissions and/or specific pollution-control technologies that must be used. For instance, setting emission standard means legally allowing polluters a certain level of emission beyond which it becomes punishable by law. Under the CAC approach, the government directly intervenes in the activities of polluters to make them perform in a standard manner. CAC comprises both laws that specify allowable quantities of pollution and laws that detail which pollution-control technologies must be

used. It directs the business entities to install specific pollution treatment equipment or technology. The regulator/authority: (i) prescribes how much pollution a source is allowed to emit and (ii) specifies steps and standards and monitors/implements so that individual polluters must take action to generate pollution below the prescribed limit. CAC is preferred over other instruments of regulation when the 'marginal abatement costs' (MACs) of pollution treatment are uniform across all firms in the regulated industry. However, due to asymmetric information, it could be difficult for a regulator to get the knowledge of such costs. Further, the business entities may manipulate information strategically. Thus, the asymmetric information about the various aspects of the regulated activities may lead to sub-optimal outcomes of the CAC policy of environmental regulation.

5.3.1 Types of Environmental Standards

An environmental standard is defined as a policy guideline to regulate the effect of anthropogenic activities on the environment. For instance, the standard of water quality for fish is set by taking into account the presence of a certain level of 'biochemical oxygen demand' (BOD) and 'chemical oxygen demand' (COD). Likewise, for water quality, a desirable level of 'total dissolved solids' (TDS) may be specified (e.g. 500 mg/l to 2000 mg per litre). Environmental standards are the oldest policy tool used either to control or prevent environmental degradation. While institutionalisation of environmental standards is crucial for the environmental protection, their enforcement is even more important. Sometimes, some standards remain only in rulebook due to lack of political will to effectively execute them. In some others, enforcement of standards is expensive and hence the standards are not properly implemented and monitored by the regulating authorities (e.g. monitoring of waste discharge). Under the CAC system of regulation, the regulating authorities can use three types of standards (viz. ambient, emission and technology) as tools for the environment protection.

Ambient Standards: An ambient standard denotes maximum allowable level of a pollutant in the receiving medium (air, water, or soil). It is a ceiling on the 'never-exceed level'. It could be the ambient quality of air over a particular city or the ambient quality of water in a particular river. Ambient standards, therefore, refer to the quality of the surrounding environment and are expressed in terms of average concentration levels of pollutants. Setting ambient standards requires an explicit agreement on the desired environmental quality objectives and the cost that the society is willing to bear to meet the same. For instance, in India, the 'central pollution control board' (CPCB) notifies 'ambient air quality standards' to regulate the quantity of twelve major pollutants (e.g. sulphur dioxide, nitrogen dioxide, particulate matter, ozone, lead, carbon monoxide, etc.) in the air. CPCB sets different limits of these pollutants in two categories: (i) 'industrial, residential, rural and other areas' and (ii) 'ecologically sensitive area'. Ambient standards can be set at different levels for different locations. It is, therefore, useful to protect ecosystems in a way that is different from using emissions standards. Ambient standards cannot, however, be enforced directly. What can be enforced are the various emissions that lead to ambient

quality levels. For instance, to ensure that dissolved oxygen never falls below a certain level in a river, we must know how the emissions of the various sources on the river contribute to changes in this measure and then introduce some means of controlling these sources.

Emission Standards: An emission standard is a maximum rate of emission that is legally allowed by a source. They are also 'never-exceed levels' applied directly to the quantities of emissions coming from pollution sources. Also known as 'performance standards', they may be established in terms of what can be achieved with available technology by estimating the discharges that are compatible with the ambient standards defined for the pollutant. For this, considerable information on both the pollution sources and the ambient environment are required. In India, the CPCB prescribes the ceiling on quantities of emissions for pollution sources. For instance, Bharat Stage Emission Standards are the standards set for motor vehicles in India. The Supreme Court of India has ordered to ban the sale and registration of motor vehicles not complying with the Bharat Stage IV emission standards with effect from April 1, 2020. The regulating authorities can set even higher standards for new plants. Such standards are known as 'new source performance standards' (NSPSs). These are significantly stricter than the standards imposed on the existing plants. It is easier for new plants to adopt cleaner processes and new emission standards in the initial design.

An 'emission standard' differs from an 'ambient standard' in the sense that its use does not determine the ambient level of a pollutant in the environment. It rather attempts to reduce the overall amount of a pollutant released on a firm-by-firm basis. Setting emission standards does not necessarily mean meeting ambient standards. For instance, emission standard could be imposed on firms but if there is no control on the number of polluting firms established, aggregate environment quality (ambient standards) cannot be curtailed. We can explain the effect of setting of an 'emission standard' on a polluting firm with the help of a diagram (Fig. 5.1).

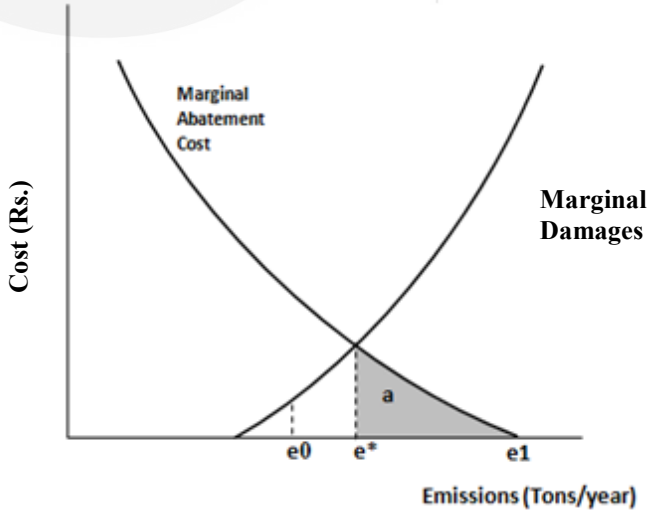

Fig. 5.1: MACs Versus Marginal Damages/Source: Field & Field (2017)

Fig. 5.1 shows 'marginal abatement cost' (MAC) and 'marginal damages' relating to the rate at which some production residual is emitted into the

environment. Costs are measured on vertical axis and emission level on the horizontal axis. Suppose that the initial level of emission is at e_1, a rate substantially above the efficient rate of e^*. To achieve e^*, the regulator sets an emission standard at e^* level. If the firm reduces emissions in accordance with this standard, it will incur an amount equivalent to the shaded area '*a'* per year as its abatement cost. The abatement cost is the compliance cost of meeting the standard.

Technology Standards: Under the CAC policy approach, the regulating authorities can direct the polluting firms to use specific technologies, techniques, practices, including engineering design and production process for achieving the environment targets and then periodically monitor the compliance. Known as 'technology standards' these are based on the knowledge of what can be achieved with current equipment and practices. These standards would compel the polluting firm to use a particular pollution control technology (such as installing scrubbers on smokestacks). Such methods/standards help in easy monitoring. For instance, if the regulator directs the polluter to use 'positive crankcase ventilation' (PCV) valve in all engines as a technology to control pollution, it would be relatively easier to monitor. This is because an inspector or monitoring officer could simply observe whether or not the equipment has been installed.

In contrast to emission standards, technology standards impose on the industries a need to decide on the required 'technological change' to be adopted in order to meet the environment standards. A major drawback of a 'technology standard' is that the polluters have no choice in deciding any other cost-effective measure to achieve the same environmental target. It does not provide opportunity to the polluter to explore some cheaper methods/ processes/technologies to attain the same level of emission. In case of emission standards or performance standards, it stipulates the maximum emissions allowed per unit of economic activity to control pollution allowing polluters to choose among available alternatives to obey the prescribed standard. For instance, when a producing unit is told to cap emissions per unit of output, the directive provides some discretion and flexibility for the polluting unit (to choose the best mechanism among the available alternatives for achieving the target). In case of technology standard, such discretion for the industries is absent. Performance standards can be combined with technology standards. For instance, when the government sets a standard that a new car may emit no more than X grams of carbon monoxide per mile driven, all new cars would be required to have an inbuilt system for capturing pollution emitted. This is an example of combining 'performance standard' with 'technology standard'. A comparison of technology standards with performance standards indicates that the latter is preferred over the former because of the flexibility that it affords.

5.3.2 CAC Approach and Equi-Marginal Principle

As compared to the economic incentives approach (not discussed in this unit), the CAC approach is considered less efficient. This is because under the CAC approach, the marginal cost of abatement of pollution varies across

firms within the same industry. The equi-marginal principle states that in order to get the optimum level of emissions, different sources of emissions must be controlled in such a way that they have the same marginal abatement costs. This implies that different sources of a pollutant need to be controlled by different degrees, depending on the shape of the marginal abatement cost curve at each source. In reality, it is difficult to do so. Generally, therefore, standards are designed to be applied uniformly across all polluting firms within the industry. Since the marginal abatement costs could be different in different firms, setting of identical standards for all the firms under the CAC regulation would provide a less efficient outcome. Greater the differences in marginal abatement costs among sources, the lower will be the performance of the equal-standards approach. We can explain this with the help of an example.

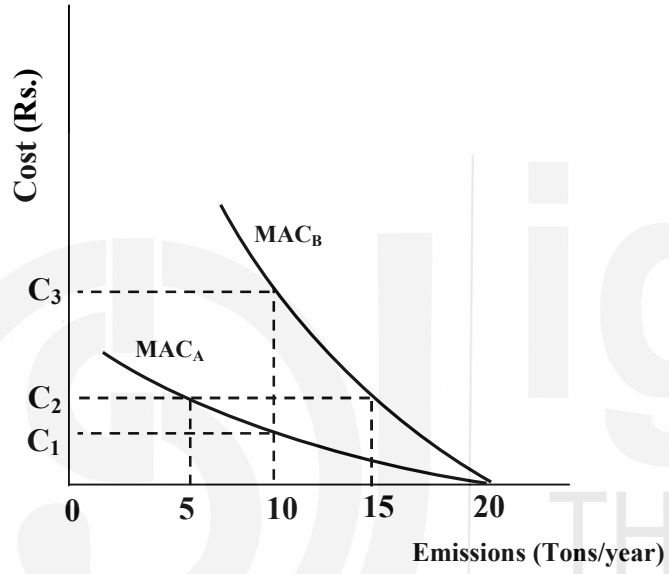

Fig. 5.2: Two Firms with Different MACs
Source: Field & Field (2017).

Suppose there are two firms A and B with different marginal abatement cost (MAC) curves (Fig. 5.2). For Firm A, MAC increases by a lower rate as emissions are reduced than it does for Firm B. In other words, slope of MAC for Firm A is lesser that that of Firm B. To get an overall reduction of 20 tons of emissions per month, the regulator can set emission reduction target of 5 tons/month for Firm A and 15 tons/month for Firm B [as the MAC of both the firms are same at these emission reduction levels i.e. equi-marginal principle holds]. However, to accomplish this, exact knowledge of MAC of both the firms is required. In the real world, with large number of firms having different levels of MAC, regulators find it either difficult to get correct data on MAC of different firms or the collection of data would be expensive. In view of this, equi-marginal principle rarely holds in real world.

Check Your Progress 2 [answer within the space given in about 50-100 words]

1) Specify the objectives of the CAC approach.

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2) What makes the CAC approach inherently result in sub-optimal outcomes?

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3) State the types of 'environmental standards' applied in practice. In what way the 'technology standard' is a drawback over 'emissions/ performance standard'?

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4) What is meant by the 'equi-marginal principle'?

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5.4 ECONOMICS OF ENFORCEMENT OF THE CAC APPROACH

There are two primary dimensions of enforcement: monitoring and sanctioning. Figure 5.3 shows the 'marginal abatement cost' (MAC) and 'marginal penalty cost' (MPC) curves. MPC curve represents the expected penalties that the firms face for violating an emission standard. MPC arises when the firms are detected to be exceeding their emission standard and penalties are levied as a result. If a standard is set at e^*, MPC will be zero if emission is less than e^*. The MPC curve shows that penalties would increase as the size of the violation increases. If current emissions are at e^o, the firms will reduce the emission because MAC at e^o is much below the corresponding MPC. But the firms will stop reducing emissions at e_1 because if the emission level is less than e_1, they would prefer to pay penalty (MAC being greater than MPC). Their emissions will end at e_1, and the amount of non-compliance will be $e^* - e_1$. Non-compliance can be reduced to zero by raising the MPC [as shown in dotted line ($MPC^/$) in Figure 5.3]. At e^*, MAC

is equal to MPC′. Under the CAC system of regulation, enforcement is a costly affair because regulators require more resources to monitor the activities of the polluting entities. They have to deploy trained manpower to make periodical monitoring and random checks to control emissions. However, today, due to the advent of digital technologies, real-time monitoring and online reporting of emissions has become possible and affordable.

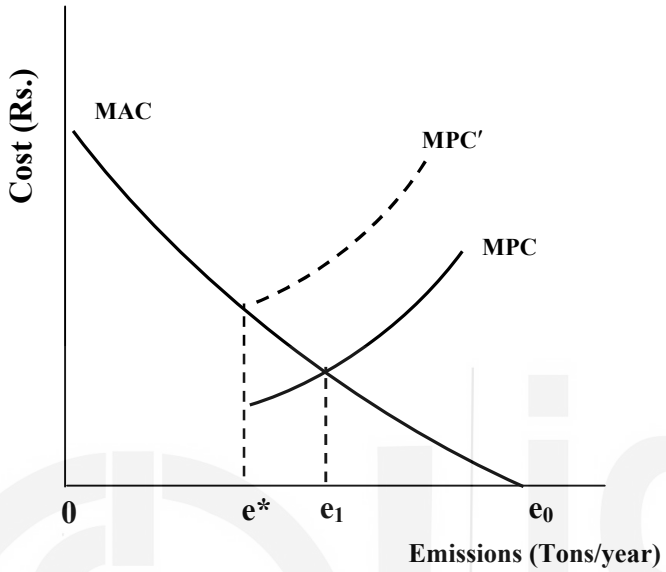

Fig. 5.3: The Economics of Enforcement
Source: Field & Field (2017).

5.4.1 Advantages and Disadvantages of the CAC Approach

There are several advantages and disadvantages of CAC policy approach. Some of its advantages are: (i) more flexibility in regulating complex environmental processes, (ii) greater certainty in how much pollution control results from regulations and (iii) simplified monitoring of compliance with a regulation. For instance, in an urban area with factories at different locations (contributing differently to overall levels of urban pollution), it can be difficult to decide a set of emission taxes (or other incentives) to ensure a certain level of pollution. Further, monitoring is easier in CAC regulations in comparison to measuring pollution emissions. For instance, if a CAC regulation states that a particular piece of pollution control equipment must be used, then the task of monitoring is one of identifying whether that equipment has been installed or not. The CAC approach has several disadvantages. Some of them are as follows.

a) Under the CAC regulations, it is very costly for regulators to collect necessary information. They often have to collect it from the polluters themselves, thus creating the possibility of getting distorted information from them.

b) CAC regulation offers no incentive to improve quality of environment beyond the standard set by a particular law. Once the CAC regulation has been satisfied, polluters have zero incentive to do better. There is,

therefore, no incentive for innovation and creative ways to reduce emissions.

c) The biggest theoretical problem with CAC regulation is the difficulty in applying the equi-marginal principle of pollution control costs among different polluters generating the same pollution.

d) CAC measures are considered inflexible since they apply the same standard for all polluters often with the same pollution-control technology. It is, therefore, unlikely that the measures would be cost-effective in decreasing the emissions as MAC varies among the sources.

e) It is argued that since the CAC regulations are framed by the legislators, they are subject to compromises in the political process due to influence of lobbyists.

f) Effective implementation of the CAC approach becomes difficult when technology is constantly evolving. The regulatory agency has to make frequent changes in the standards with changes in technology.

g) In CAC regulations, the polluter pays only for pollution control and not for the damage caused by pollution that is emitted even after the control. This actually provides a kind of subsidy to the polluter creating distortions. As a result, there will be more pollution than the efficient level.

5.5 KEY ISSUES RELATED TO CAC POLICY

Pollution regulation is complicated by the physical environment that interposes itself between polluters and consumers. There are differences between pollution and ambient concentration of the pollution. Generally, it is the ambient concentration that causes damage. However, ambient concentration is imperfectly connected with the emission that needs to be regulated. This brings 'space' and 'time' into the consideration of the regulators. Generally, sources of pollution nearby will generate more damage than sources located in distant suburbs. Time, though less important than space, also exerts significant influence on environmental transformation. This refers to the hour-to-hour, day-to-day and season-to-season variation in pollution. Capturing these time and space factors into decision making is a difficult task.

5.5.1 Efficiency Versus Cost Effectiveness

Efficiency in enforcement of regulation calls for a balance between the 'cost of emission control' with the 'damage from ambient pollution'. The cost-effective character of environmental regulation refers to a set of regulatory mechanism that can achieve 'emission target' at the least possible cost. The significance of CAC mechanism over other alternative forms of regulation depends on both the economic efficiency and cost-effectiveness of the former in comparison to the latter. Economic efficiency is defined as the maximisation of 'social welfare' (in terms of market concepts). It implies the maximisation of the 'net present value' (NPV) of benefits over time from the

CAC approach. Theoretically, this happens at a point where the benefit from the reduction of emissions [measured as the 'marginal abatement benefit' (MAB) measured as a reduction achieved in damages] is equated as 'marginal abatement cost' (MAC). Further, since there are many polluters with each polluter emitting pollution as per his own marginal abatement cost, the aggregate level of emissions at their respective MACs becomes necessary to be considered as 'efficient'. This means, since the level of pollution and damages vary from location to location or from time to time (i.e. in both the spatial and temporal dimensions), only when the MBCs adjusted by individual polluters are equal across all polluters, the efficient level of pollution could be considered as achieved. However, this is very difficult to monitor and implement in practice. Therefore, cost-effectiveness is taken as the acceptable analytical framework.

Cost-effectiveness of a policy is defined as achieving the target/goal by implementing a said policy at least cost. Cost-effectiveness does not however necessarily maximise 'social welfare'. It is, therefore, very often said that all efficient pollution reduction policies are cost-effective but not vice-versa. A policy may be said to be cost-effective when the MACs are equal for all polluters. Although the CAC approach is popular for its ease of compliance monitoring and enforcement, it may be less cost-effective in comparison to other approaches. This is because, it can be argued that the same targets might be achieved at a lower cost or more environmental protection might be achieved by incurring same expenditure. Moreover, this approach may not quickly adopt new technological innovation or incentivise polluters to reduce pollution beyond standards prescribed by authorities.

5.5.2 Ambient-Differentiated Versus Emission Differentiated Regulation

Typically, a unit of pollution from one polluter will have a different effect on ambient concentration than a unit of pollution from another polluter. Ambient-differentiated regulation will control the two polluters differently based on their different contributions to ambient concentrations. The emissions-differentiated regulations will ignore the differences between the two polluters even though the overall level of emissions will still be controlled so as to achieve the ambient target.

To conclude, the basic issues in environmental regulations may be enumerated as: (i) decision on command and control versus economic incentives; (ii) sources of pollution and their control; (iii) information (particularly private information) which polluters may have but not readily part that the regulator needs; (iv) risks and how to deal with the problems of risks; (v) what sort of regulations are appropriate; (vi) growing competition between jurisdiction vis-à-vis environmental regulations; (vii) incidence of regulations i.e. who bears the burden either in terms of cost or damage; (viii) who reaps the benefits and (ix) innovations and technical change.

Check Your Progress 3 [answer within the space given in about 50-100 words]

1) Under the CAC approach, why is 'enforcement' a costly affair?

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2) State the advantages and disadvantages of the CAC approach.

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3) Why is 'pollution regulation' generally considered complicated?

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4) How is 'cost-effectiveness' defined? Why is 'cost-effectiveness' taken as the acceptable analytical framework under CAC amounts to a compromise?

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5) Why is 'ambient differentiated regulation' a better approach than the 'emission differentiated regulations?

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5.6 LET US SUM UP

Command and control policy approach of environmental regulation includes the setting up of environmental standards for different activities, prescribing rules and regulations for the production process and ensuring their enforcement for controlling the generation of pollution by fixing an acceptable limit of the pollution level, etc. The CAC approach basically involves setting three types of standards viz. ambient, emission and technology standards (the three together making up the environment). An 'ambient standard' sets the maximum allowable levels of a pollutant in the receiving medium (i.e. air, water, or soil). An emission standard is a maximum rate of emission that is legally allowed by a plant or a source. In contrast to emission standards, technology standards impose on polluters certain decisions on technologies to be used. This is therefore a form of 'technology forcing' on polluting industries to adopt technological change in order to meet the environment standards. The major drawback of CAC approach is that it does not provide opportunity to the polluters for innovation. The significance of CAC approach can be evaluated by taking into account its efficiency and cost-effectiveness. Several factors which complicate the implementation of these regulations are environment, space and time. For this, the distinction between ambient-different and emission-different regulations is important.

5.7 KEY WORDS

Command and Control (CAC) Approach : CAC prescribes regulations on what to do and in what measure?. They involve the environmental regulator stipulating the action that an individual firm or polluting agent should take with regard to pollution control for environmental protections. A polluter may have limited flexibility in how it meets the regulatory requirements.

Efficient Emissions : When the cost of abating one more unit of pollution by one polluter is equal to the cost of abating one more unit of pollution by another is equal across 'n' number of polluters, then an efficient aggregate level of emission is achieved.

Cost-Effectiveness : The cost-effectiveness of a policy is defined as achieving the target/goal by implementing a said policy at least cost.

Liability : It means if you harm someone, you must compensate that person for damage.

Ambient-Differentiated Regulation : Refers to the compensation for damage inflicted.

Emission-Differentiated Regulation : This ignores the differences among polluters and tries to control pollution in such a way as to achieve the ambient target.

5.8 SOME USEFUL BOOKS AND REFERENCES

1) Barry C Field & Martha K Filed (2017). *Environmental Economics: An Introduction*, McGraw Hills, USA.

2) Kolstad C D (2016). *Intermediate Environmental Economics*, Oxford University Press, New Delhi.

3) Phaneuf D J & Requate T (2017). *A Course in Environmental Economics: Theory, Policy and Practice,* Cambridge University Press, Delhi.

5.9 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) The capacity of the environment to absorb the wastes generated from different activities by man is limited. When this limit is crossed, environmental degradation begins. Government intervention becomes necessary at such a stage.

2) Same as outlined for 1 above. Additionally, the rationale comes from two basic theories viz. public interest theory and interest group theory. The former bases its rationale on factors like imperfect competition, incomplete information and externalities. The latter bases it on the grounds of protecting the interests of specific groups or regions.

3) Enact rules and regulations, institute enforcement authorities to implement and place a system of fines and penalties for dealing with cases of violation.

Check Your Progress 2

1) *Regulate* the production and consumption of certain activities, *prompt* people and business entities to bring about a behaviour considered socially desirable and *ensure* the compliance through enforcement mechanism (court, police, fines, etc).

2) Due to asymmetric information, difficulty in collecting correct data and manipulative behaviour of producers to suppress correct data.

3) Environmental, ambient, emission and technology standards are the four types of quality standards applied in practice. Technology standards give the industries no choice on any other cost-effective measure to achieve the environmental standards set. It is thus a compelling measure.

4) The principle states that in order to get the optimum level of emissions, different sources of emissions must be controlled in such a way that they have the same marginal abatement costs.

Check Your Progress 3

1) Due to more resources required to monitor the activities of the polluting entities.

2) Flexibility, certainty and simplification are the advantages. High cost of collecting information, absence of incentive to improve upon prescribed emission standards, difficulty in applying equi-marginal principle of pollution control costs among different polluters, etc.

3) Because of the physical environment that interposes itself between polluters and consumers. In other words, because of the dimensions of 'time' and 'space' entering into the regulators' matrix of consideration.

4) Cost-effectiveness of a policy is defined as achieving the target/goal by implementing a said policy at least cost. A drawback of considering this is that it 'does not necessarily maximise social welfare'. Additionally, since the MACs would be different for each polluter, equating their individual MACs with the MBCs after the required adjustment at each level becomes ideally necessary, but is difficult to achieve in practice.

5) Ambient-differentiated regulation will control two polluters contributing to pollution differently whereas the 'emission-differentiated regulation' does the same without differentiating them for the factor of 'difference in contribution to the ambient concentration'.

UNIT 6 MARKET BASED INSTRUMENTS*

Structure

6.0 OBJECTIVES

After reading this unit, you will be able to:

- indicate how 'market based instruments' (MBIs) aim at achieving the environmental standards by extending economic incentives;
- explain how the 'pollution fees' approach serves as an effective instrument in controlling environmental pollution;
- discuss how 'tradable emission permits' are useful in controlling environmental pollution;
- describe the efficacy of the methods of 'subsidies' and 'refundable deposits' in controlling pollution levels;
- outline how the concept of 'liability' is an effective instrument in enabling the 'polluting units' attain their efficient level of pollution;
- state the advantages and disadvantages of MBIs; and
- write a note on the cost-effectiveness character of 'emission trading' approach with illustration.

6.1 INTRODUCTION

As studied in Unit 5, there are two broad regulatory instruments to control pollution: prescriptive regulatory instruments [called 'command and control' (CAC)] and 'market-based instruments' (MBIs). MBIs offer flexibility and incentives to polluters in using alternative technologies and production practices. By opting for preferred method, the producer can reduce the emission level of his production unit. The MBIs are thus distinguishable from

* Dr. Dipti Nayak and Prof. S. P. Singh, I. I. T. Roorkee.

the CAC methods for offering the flexibility to change the behaviour of polluters towards more efficient use of resources. They also provide rewards for polluters to do what is perceived to be in the public interest. There are five broad types of MBIs: (a) pollution taxes/fees, (b) marketable permits, (c) subsidies, (d) refundable deposits and (e) liabilities (or damages). In each one of these, we can see some kind of economic incentives to the polluting entities to control pollution. The MBIs, thus, offer incentives to private firms in choosing cost-effective pollution control technologies, mechanisms and strategies by expanding investment in R&D. For instance, firms are charged 'pollution fees' for each unit of emissions but are allowed to emit as they desire. Since generating additional units of emissions implies more cost to a firm in terms of pollution fees, firms would think of reducing their emissions. For this, they use all forms of information on cost controls of alternative technologies. A government (regulator) can raise the cost of emission fees for making the generation of pollution costlier for the firm. This would create an incentive for the firm to adopt better production technologies and management practices to reduce emission per unit of output produced. Likewise, 'emission trading' offers scope for purchasing permits for the firm generating more pollution than the permitted limit. It is, therefore, in the best interest of the firms to have 'surplus permits' and trade them in the market. Likewise, subsidies given for adoption of 'green and clean sources of energy' provide an incentive to producers to change their mode of production by shifting to 'green technology'. In a similar way, 'liability' is an instrument which imposes legal pressure on firms to produce what is believed to be in 'social interest'. All MBIs, thus, provide some or the other kind of incentives to the polluting entities to limit their emission levels. We shall now take up each of them for a more detailed analysis.

6.2 POLLUTION FEES/PIGOUVIAN TAX

Pollution fees are the payment made per unit of pollution emitted by the polluter to a regulatory body. Such a fee acts as an incentive to reduce emission because if emission is reduced, less 'pollution fee' would be paid. It is, therefore, in polluters' interest to reduce emissions. Though the concept of pricing pollution dates back to Arthur C. Pigou (1920), its practical application was developed by the environmental economist Alan Kneese in 1962. Firms pollute because they are not accountable for the 'social damage' they create. Government tries to control pollution by charging an 'emission fee' in one of two ways: (i) either a per unit emission fee or (ii) by subsidising each unit of emission abated (reduced) by the firm.

To understand how the polluters respond when charged a specific fee for their emission, we can take the example of a power generating firm. Let us assume that total amount of pollution generated by the firm is 'x'. If the emission fee per unit is 'p', the amount to be paid as 'pollution fee' is 'px'. There are two components of pollution cost: (i) cost of pollution abatement and (ii) pollution fees. The total cost of pollution generated being: pollution abatement cost + pollution fee, we have:

$$Tc(x) = C(x) + px \qquad (6.1)$$

To minimise total cost, we need to consider the marginal conditions. This means:

$$\frac{d[Tc(x)]}{dx} = 0$$

$$\frac{d[C(x)]}{dx} + p = 0$$

$$MC + p = 0 \text{ or } p = -MC$$

If the firm does not reduce pollution by incurring 'pollution abatement expenditure', with increased pollution emission, cost to the firm is decreased. Because of this, when the level of pollution is increased, MC i.e. 'marginal cost' (or MAC i.e. 'marginal abatement cost') is negative. In other words, when pollution increases, and the firm does not incur cost to reduce the pollution, the firm saves its expenditure by not spending on reducing the pollution. Thus, savings from emitting one additional unit of pollution [i.e. 'marginal savings' (MS)] is 'zero'. Alternatively, when emission fee is zero (i.e. there is no intervention for pollution regulation), the consequent level of emissions would be the highest and vice-versa. This feature of MS function makes it to have a negative slope (i.e. when we measure the level of emission on the X-axis and 'price per emission' on the Y-axis, the MS curve would be downward sloping). On the other hand, MC function will increase with increase in the amount of 'abatement cost' (Fig. 6.1). Thus, 'marginal saving' is equal to the negative of 'marginal cost'. That is:

$$P = -MC(x) = MS(x) \qquad (6.2)$$

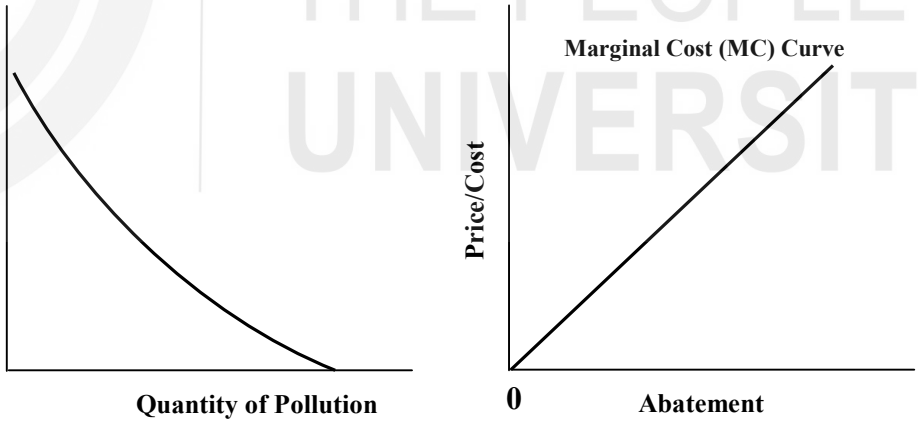

Fig. 6.1: MS and MC Functions

Equation (6.2) implies that the firm chooses to operate where the 'marginal savings' (MS) from emitting one more unit of pollution is equal to the MC of reducing pollution by one unit i.e. MAC = pollution fee per unit. Smaller amount of pollution emitted would involve higher abatement costs (i.e. higher than the pollution fee). Thus, lowering emissions would raise total abatement costs. Conversely, emitting a larger amount of pollution would mean 'lower abatement costs' for the firm or more emission fee for the firm. Both these are not good for the firm. The efficiency or optimal condition is,

therefore, that the 'firms will abate pollution up to the point where the MAC is equal to MS from emitting. Therefore, it is at this level the emission fee also should ideally be set. This is also the point where the firm's total cost is the lowest. A Pigouvian fee is thus an 'emission fee' set equal to the 'aggregate marginal damage of emissions' when evaluated at the efficient level of pollution. We can explain this first by taking a single polluter (Fig. 6.2). The downward sloping curve is the MS curve and the upward sloping curve is the MD (marginal damage) curve. Given that the total damage cost TC (X) = abatement cost + damage cost i.e. C(x) + D(x), MD_1 is the marginal damage to the first victim and MD_2 is the marginal damage cost to the second victim, and so on. Since pollution damage is a 'social bad', the aggregate damage to society is obtained from the 'vertical summation of individual damage costs'. The optimal amount of pollution is reached at the intersection of MD and MS curves i.e. at point E. At efficient level of pollution, the firm will minimise total costs and damages. This means at x*, optimal level of pollution MC(x*) + MD(x*) = 0. Or, the optimal amount of pollution is at x* when MD (x) = – MC (x) = MS (x). If the Pigouvian fee is set at p*, then the polluter will take care to minimise his emissions so that the fee (p*) = MC. Hence, MC (x*) = –p* or MS (x*) = p*. The Pigouvian fee is, therefore, defined as the 'MS from pollution at the optimal level'. If we are not at the optimum level of pollution, the Pigouvian fee will be neither the current MC of pollution nor the MD from the pollution. The Pigouvian fee is, therefore, not any emission fee, rather it is the MS from pollution at the optimal pollution level.

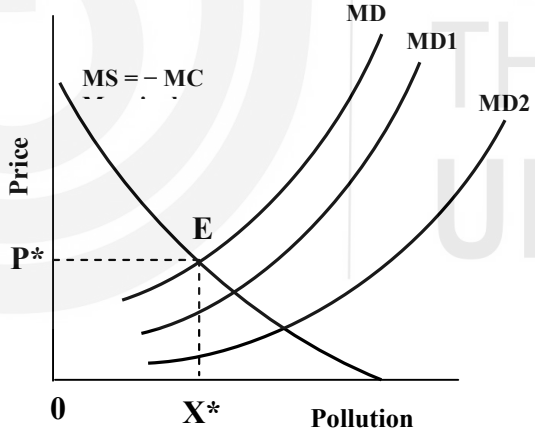

Fig. 6.2: Pigouvian Fee with a Single Polluter

Source: Field & Field (2017).

We can also prove this by taking the marginal benefit and marginal cost concepts (Fig. 6.3). Since the 'marginal benefits' (MB) can be taken as the demand curve and the 'marginal costs' as the supply curve, their point of intersection gives us the efficient level of production and the corresponding market price. In case of a negative externality like pollution, 'marginal social cost' (MSC) is higher than the 'marginal private benefit' (MPB) and hence a tax amounting to externality can be imposed to make MSC = MPC (marginal private cost). But in case of positive externality, marginal social benefit (MSB) is higher than MSC, giving a rationale for offering subsidy in order to make MSB = MPB. In the absence of any kind of intervention, the firm

would produce up to point E, where the marginal private benefit (MPB) equates with the 'private marginal cost' (PMC). However, this is not the socially efficient quantity of production since the firm generates negative externality which is not reflected in the cost of production of the firm. Therefore, MSC (= PMC + externality) is higher than the MPC and socially efficient quantity is produced at Q* corresponding to the point E*. Our interest is to know 'what should be the level of Pigouvian tax for controlling emission'. Since due to externality, MSC is exceeding MPC, the amount of tax which is equal to 'marginal external cost' (MEC) is decided by the difference between the MSC and PMC i.e. at the point of 'socially efficient production'. This means that the tax is not equal to the MEC at other quantities but is at the level of socially efficient quantity. Although a tax is introduced, it is still not compensating the externalities at other quantities of production except at Q*. Hence, if the firm produces beyond Q*, there will still be some externality which is not taxed per unit of pollution. Therefore, Pigouvian fee is not an emission fee, rather a special case of pollution tax.

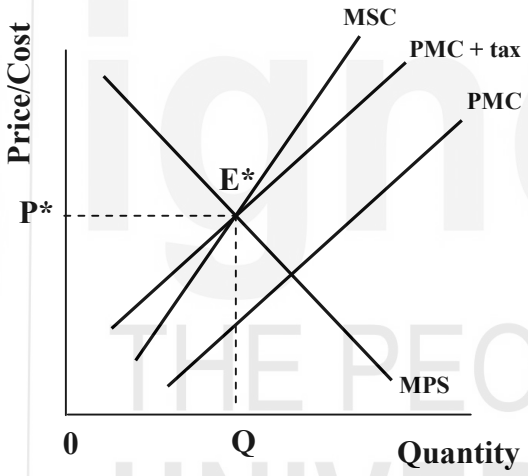

Fig. 6.3: Pigouvian Tax

Likewise, in case of multiple polluters, equi-marginal cost conditions are sought (Figure 6.4) where MS (x) tells us how much of total x should be optimally emitted. Each MS_i (x) tells us how much each firm will contribute to the total. Since MS is like a private good for polluting firms, total MS is determined by the 'horizontal summation of individual MS curves'. The efficient amount of pollution x^* is determined by the point of intersection of MS and MD. This also determines the MS to polluters with P* as the correct Pigouvian fee. At this fee level, firm 1 will generate x_1^*, firm 2 will generate x_2^* of emission and so on. Each firm therefore operates in a way that MS from polluting is set equal to the Pigouvian fee i.e. $MS_1(X_1^*) = MS_2(X_2^*) = P^*$ and $MS(X^*) = P^*$. The benefit of Pigouvian fee is that all firms will control pollution at the same level of MC following the equi-marginal principle of pollution control.

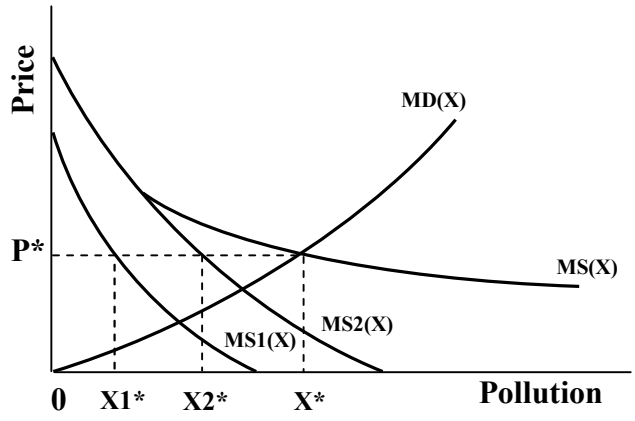

Fig. 6.4: Pigouvian Fee with more than one Polluter

Check Your Progress 1 [answer within the space given in about 50-100 words]

1) What are the key market-based instruments for controlling pollution?

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2) To what extent a single firm must abate under a pollution tax policy?

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3) What is the condition of abatement in case of multiple firms under pollution tax?

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4) Distinguish between 'pollution tax' and 'Pigouvian fee'.

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6.3 TRADABLE EMISSION PERMITS

Compared to emission fee, market trading system is more decentralised. A 'tradable permit' allows a polluting firm to buy and sell the right to pollute by exchanging the 'number of emission permits' from other firms in the industry. Thus, if a firm has to emit pollution (i.e. it cannot abate its pollution by changing production practices), it has to purchase permits to pollute. The price of the permit is similar to a tax on emission. Tradable permits are thus a quota and holding the number of permits is enabled by the buying of such permits from the market. The initial holding of permits involves two mechanisms for its distribution viz. (i) auctioned pollution permits and (ii) freely distributed transferrable permits. Under the first mechanism, the government auctions off a fixed number of ex-ante rights to emit a unit of pollution. In case of freely distributed transferrable permits, the government sets the limit of pollution and distributes permits by fixing the aggregate pollution goals. The firms do not have the right to unlimited pollution but to emit a limited quantity without any charge. Once the initial endowment is exhausted, trading offers the choice. There are three types of trading systems viz. 'offset trading', 'emission rate trading' and 'cap and trade'.

The origin of 'offset trading' is traceable to finding a path for achieving pollution reduction while continuing the efforts for economic growth by expanding output and production. Since the latter would be adding on to overall pollution levels, the mechanism of 'offset trading' targets the 'new firms' to pay the 'existing firms' to reduce their emissions so as to offset the added emissions of the new firms. Thus, trade between two firms transacting emissions through voluntary agreement becomes 'offset trading' (or 'credit trading'). 'Emission trading', on the other hand, is expressed in terms of the rate that a pollutant constitutes in total output. For instance, greenhouse gas emission rate can be defined as tons of CO_2 per 1000 megawatt hours of power production. Once the base rate is set, trading is possible between sources either voluntarily or through regulation. The emitters, who can emit below the base rate, can sell their credits to those who need to emit above their apportioned base rate. In 'cap and trade', the regulator sets a cap (a limit) on overall emissions and allows trading among polluters to determine their respective levels of permitted pollution. This system is more centralised. Trading involves a price (or value) on a permit to pollute. Such a trading system becomes an incentive to reduce pollution as firms realise polluting to be an expensive activity. For polluting firms, less pollution means fewer permits needed to be purchased. There is also an 'opportunity cost' of emitting since by not emitting, the firms can earn permits which they can sell to others in need. We can further illustrate this as follows.

Suppose the government has introduced a cap and trade scheme to reduce the amount of greenhouse gases emitted from power plants. The current total emissions is 1,50,000 tons/year and the target is to reduce the level to 1,00,000 tons/year. Since there are many firms operating in an industry, we can take the case of one single power plant emitting 5,000 tons/yr against a permit of 2,500 tons/year. In this case, the plant has three alternatives: (i) reduce the emission to 2500 tons/yr; (ii) or buy additional permit of

2500 tons/yr and emit 5000 tons/yr; (iii) or reduce emission even below the allotted permits of 2500 tons/yr and sell the surplus as permits to offset some of its abatement costs incurred. Another example is of a situation where there are two polluters with 100 units of pollution allowed in total with each firm having 50 units for permit (Fig. 6.5). MS_1 is the 'marginal savings' from emitting for firm 1, MS_2 for firm 2, e* is equilibrium holding of permits and P* is equilibrium price of permits. The Figure shows that at the optimum level of pollution e*, Firm 1 is emitting more than the allotted permits, while Firm 2 is emitting less than the allotted permits. Thus, Firm 1 can purchase extra permits (50 e*) from Firm 2. An emission fee of P* would achieve exactly the same outcome as the marketable permit.

If the 'marginal abatement cost' (MAC) is greater than the permit price, then the firm will buy extra permits and vice versa. If there are a large number of firms in the industry, by suitable buying and selling, the firms will reach a point where the aggregate MAC is equal to the price of the permit. The aggregate MAC constitutes the demand for permits and the quantity of permits fixed by the regulating authority becomes the supply side in the transaction (Fig. 6.6). In the Figure 6.6, q_1 is the 'supply of permits' (SP) allotted by the regulating body and demand curve is the aggregate of MACs of plants. Therefore, their intersecting point determines the permit price p_1. If the quantity restricted was stiffer (like q_2), the permit price would rise to p_2. Likewise, if demand curve for permits shifts upwards, the permit price too will go up. The cost-effectiveness by trading requires that there should be a single market and a single price of permit. Further, all the transacting plants should equate their MACs to the single price of permit. The basic difference between these two mechanisms (i.e. 'emission tax' and 'cap and trade') is that with an emission fee, the marginal cost of control will be precisely known but we will be less sure about the quantity of pollution.

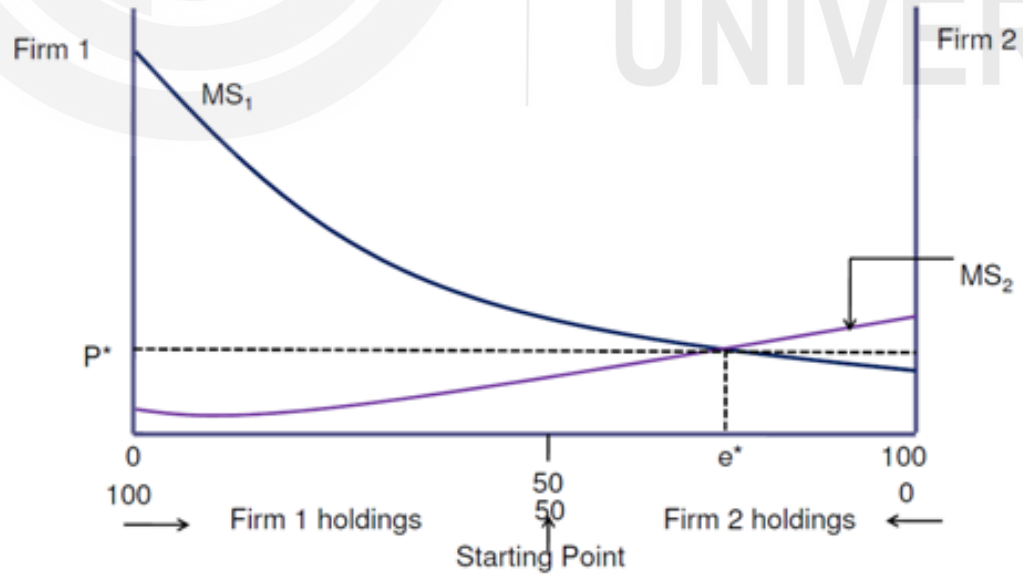

Fig. 6.5: Marginal Savings for Two Firms

Source: Kolstad, 2016.

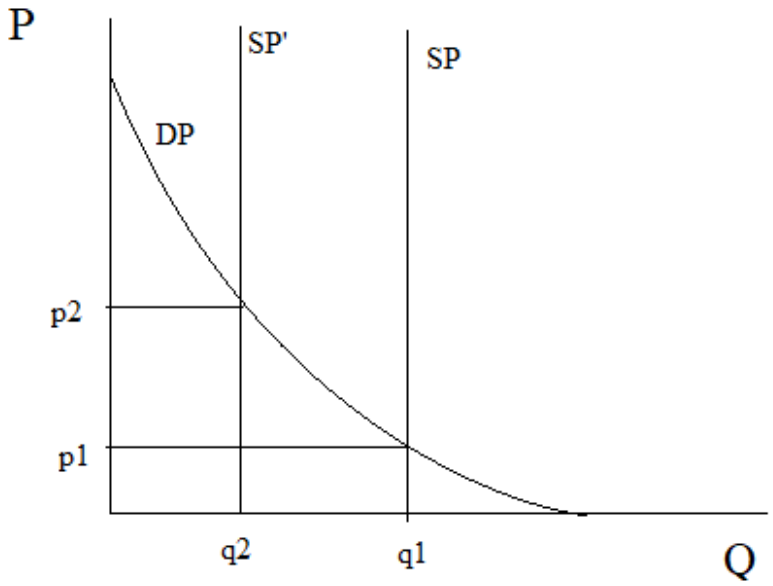

Fig. 6.6: Determination of Price and Quantity in a Permit Market

With a marketable permit, the exact amount of pollution is known, but we will be less sure about the marginal cost of pollution control. Therefore, under 'cap and trade', the quantity of restriction is fixed by the regulator and firms adjust their emissions to the permit price. In case of emission fee, emission price per unit of emission is fixed by the regulator and firms adjust their emission levels.

6.4 SUBSIDIES AND REFUNDABLE DEPOSITS

The mechanism of 'pollution fee' is based on placing a price on environmental assets where pollution is emitted. But in case of subsidy, the public authority would pay a polluter an amount for every ton of emission it reduced from a benchmark level. Thus, subsidy is to act as a reward for reducing emissions. It can also be interpreted as an 'opportunity cost', since without it, the polluter would continue to generate pollution and forgo the subsidy which can be claimed. Emission reduction incentive can therefore be considered as a complement of 'positive externality'. We also know that in case of positive externality, it is very likely that the market would produce less than the socially efficient level of production. Thus, subsidy ensures restoring a socially efficient level of production. For instance, renewable energy like wind power acting as competitor to traditional coal firms by availing 'subsidy', may make wind power more competitive. The case of subsidies in emission reduction is shown in Fig. 6.7. Given the 'private marginal cost' (PMC) and 'private marginal benefit' (PMB), the firm will be interested to produce Q_m level of output at a price P_m. This level of production is however below the socially efficient level of production of Q* (located at the intersection of MSB and PMC). As a result, both the quantity produced and the price charged per unit of quantity is high compared to competitive market. Since the positive externality related to this production is E*S, this may be regarded as subsidy which can be provided to the renewable energy producing firms. The total amount of subsidy would be $P_sSE^*P^*$.

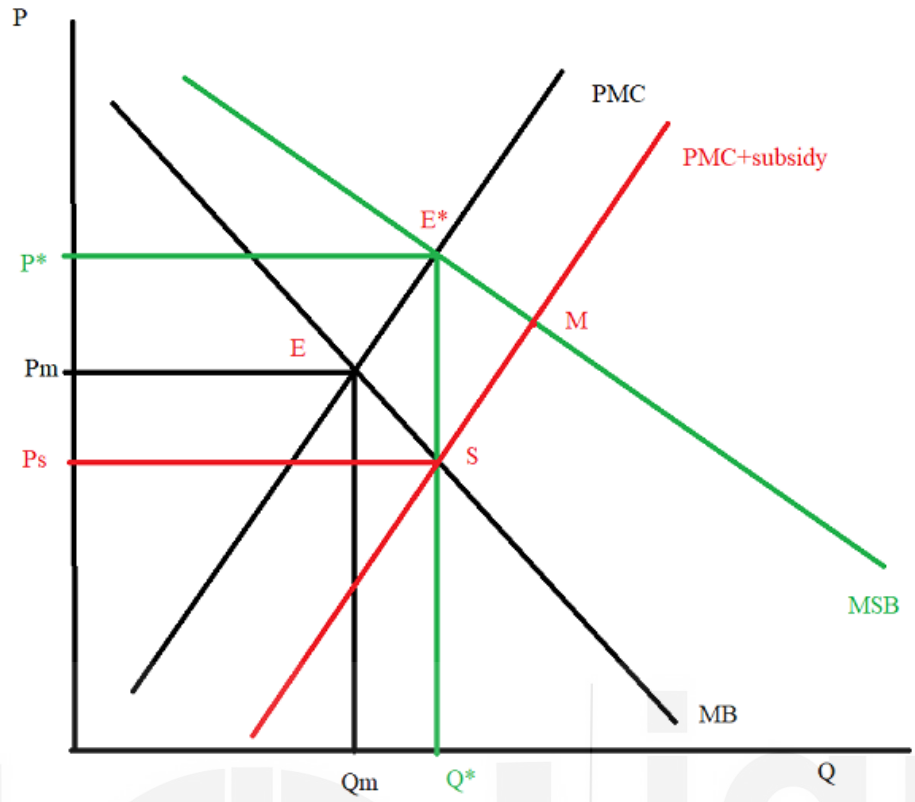

Fig. 6.7: Subsidies

Because of the subsidy, the supply curve of the firm shifts rightward thereby maintaining the socially efficient level of output at a low price (P_s) per unit.

Subsidies also have some alternative uses. It can be used as 'tax credits' helping in reducing the tax liability of a firm. Although this mechanism of subsidy reduces government revenue, the government does not have to spend. A problem with subsidies is that it can be misused which amounts to wasting public money with insignificant reduction of emissions. It also contradicts the polluters' pay principle (i.e. polluters must pay for their negative externality). Although emission per firm may be reduced through subsidy, the total emissions may increase as the industry may attract more number of firms (to take advantage of subsidy and get into business). This is a major limitation of the per unit type of subsidy as an emission reducing mechanism. However, some other hybrid type of subsidy like 'combination of tax and subsidy' may be followed [e.g. the National Green Tribunal (NGT) imposed heavy tax on polluting industries and brand cars like Volkswagen in Delhi and the funds collected were utilised by Central Pollution Control Board (CPCB) for improving air quality in Delhi].

Refundable Deposits: Robert Solow and Edwin Mills suggested the method of 'refundable deposits' wherever it is not possible to monitor, detect and observe environmental damage. In case of some sectors, it may be difficult as well as costly for the regulator to monitor the activities of polluting companies (e.g. dumping of waste into the deep sea by shipping companies). They suggested that the potential offenders should be required to leave an appropriate deposit with the environmental authorities. It is like 'caution money' taken by a hostel administrator from the students. If any student

damages any asset of the hostel, cost of damage may be recovered from the student; or else it can be returned after leaving the hostel. Refundable deposit system can also be used to encourage consumers to return back the used containers, bottles, packaging, products or their residues. It requires paying a deposit on the purchase of potentially polluting products, which is later refunded when the products or their residues are returned for recycling or disposal. It thus gives a financial incentive for consumers. Deposit-refund systems can be voluntary or mandated by legislation. If the return on deposits return is higher than the cost of deposit, it can increase the 'incentive to return' the item and reduce consumer resistance to the scheme (where there is a long period between paying the deposit and receiving the refund).

6.5 LIABILITY

Liability is another type of MBI offering economic incentive for complying with the regulation for pollution control. The basic idea of 'liability' is that if you harm someone, you must compensate that person for damage. For instance, a hazardous waste storage facility ('dump') should take steps to minimise the risks of leakage of harmful substances into environment through necessary 'precaution'. But precaution is expensive, and other things remaining constant, the dump would prefer to take little precaution. Damage to society therefore depends upon the level of precaution exercised or not exercised. In other words, both the costs of dumping and damage to society are functions of the level of 'precaution'. The socially desirable level of precaution is the point at which the 'marginal cost' of taking more precaution is just offset by the reduction in 'marginal damage' by means of regulatory mechanisms. It could be instituted as an economic incentive for achieving the reduction in 'marginal damage' by taking precaution by the firms.

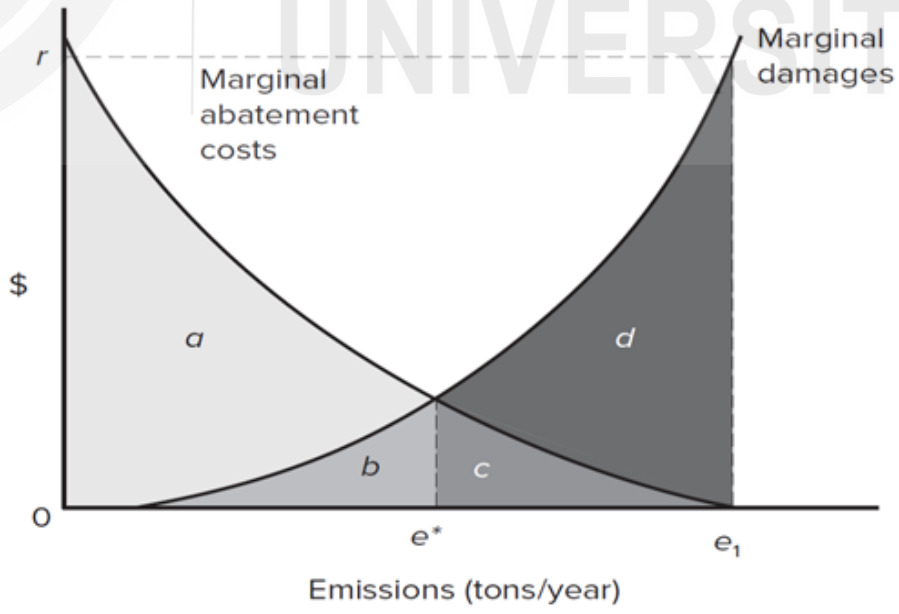

Fig. 6.8: Mechanisms of Liability and Economic Incentives

Source: Field and Field, 2017.

Here, negligence of liability works in the sense of fear of being responsible for accidental damages. It serves to act as sufficient incentive for firms to take the socially desirable amount of precaution. Because of this very principle of liability, polluters would treat economic incentives extended to compensate for the damages they create more seriously. To put it theoretically (Figure 6.8), the 'marginal abatement cost' (MAC) curve is the demand curve for liability and the 'marginal damage' (MD) curve is the supply curve for liability. The efficient level of emission is determined at the point of intersection of demand and supply curves (i.e. for liability at e*). However, if we take the actual emission, it is at e_1, which is more than the efficient level e*.

Hence, in the presence of liability principle, the cost of the damage has to be internalised. At e_1, the total compensation cost that the polluters need to pay is the area of damage represented by 'b + c + d'. The polluters could decrease their compensation costs by reducing emissions and increasing their abatement costs. It can reduce the emission as long as the MAC is less than the 'marginal damage costs' and would act as an economic incentive by reducing pollution to the efficient level of pollution e*.

Check Your Progress 2 [answer within the space given in about 50-100 words]

1) How does 'subsidies' serve as an economic incentive to control pollution?

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2) State the different mechanisms of a 'tradable permit system'.

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3) State the rationale behind the 'liability' principle to serve as an economic disincentive to polluters.

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6.6 COST- EFFECTIVENESS OF EMISSION TRADING

MBIs have the following advantages. (i) informational requirements are less; (ii) there are incentives for polluters to innovate and explore cheaper ways of controlling pollution; and (iii) mechanisms involve the polluter both to pay for control costs as well as pollution damage. There is, therefore, no implicit subsidy to the industry but only the focus on the 'equi-marginal principle'. However, the major disadvantages of MBIs are: (i) tackling complexities in environmental transformation, (ii) political conditions and (iii) difficulty in instituting tax on emissions. Despite these, MBIs score in terms of cost-effectiveness. A policy is said to be 'efficient' if it provides maximum net benefits to the society. In the case of pollution control measures, by efficiency we mean how to bring a balance between abatement costs and damages (i.e. how to equate marginal abatement costs and marginal damages). On the other hand, a policy is said to be 'cost-effective' if it produces maximum possible environmental improvement or achieve a targeted environmental benefit at a least possible cost. Further, while for a policy to be efficient, it must be cost effective, the opposite is not true. The rationale of the market is based on the fact that instead of the emission being determined by the regulator, the emitters are allowed to have their own strategy of reducing emissions. The MBIs, by giving incentives to think about the best amount of emission at the least cost possible, is flexible in its approach. The only thing the regulator would do is to determine the 'price per unit of emission' or 'amount of subsidy to be paid' for each unit of emission reduced by emitters. The effectiveness of the 'emissions charge' lies in the fulfilment of equi-marginal principle in the 'marginal abatement costs'.

The case of 'cap and trade' is synonymous to 'allowance trading'. As a part of the Acid Rain Programme in the 1990s, the US sulphur dioxide market aimed at reducing the total annual SO_2 emissions by 10 million tons (relative to 1980 when the total emissions in US was about 26 million tons). The legislation did not prescribe how exactly to reduce the SO_2 but capped the aggregate SO_2 emission thereby creating a market to buy and sell government issued permits to emit sulphur dioxide. The annual emissions are estimated to have declined even below the programme's target of nine-million-ton SO_2 goal. Thus, such a policy could prove to be cost-effective if the aggregate cost of pollution reduction/abatement are minimised as each plant has the freedom to either reduce pollution or buy pollution permits.

6.7 LET US SUM UP

Market-based instruments are indirect instruments which provide rewards for polluters to do what is perceived to be in public interest. Therefore, these instruments are said to create economic incentives to control pollution. This unit has discussed five key MBIs viz., (i) pollution taxes/fees, (ii) marketable permits, (iii) subsidies, (iv) refundable deposits and (v) liabilities (or damages). Pollution fees are payment paid by the polluter to a regulatory body per unit of pollution emitted. With an emission fee, a single firm will

abate pollution up to the point where MAC = MS = emission fee. This is also the point where the firm's total costs are the lowest. In case of multiple firms, each firm will abate to the point where the PMC (private marginal cost) is equal to the emissions fee. A Pigouvian fee is an emission fee which is exactly equal to the 'aggregate marginal damage' by emissions when evaluated at the efficient level of pollution. In case of subsidy, the public authority would pay to a polluter an amount for every ton of emission reduced from a benchmark level. Thus, subsidy acts as a reward for reducing emissions. Although emission per firm may be reduced under subsidy option, the total emissions may increase as the industry may attract more number of firms. This is a major limitation of subsidy as an emission reducing mechanism. Market trading system is more decentralised as compared to emission fee. A tradable permit allows polluters to buy and sell the right to pollute (where pollution control is expressed by the number of emission permits held). Three kind of major trading systems are discussed viz. 'offset trading', 'emission rate trading' and 'cap and trade'. The mechanism of 'offset trading' targets the new firms to pay existing firms to reduce their emissions below standard so as to offset the added emissions of the new firms. 'Emission trading' is expressed in terms of the rate that a pollutant constitutes in total output. Once the base rate is set, trading is possible between firms either voluntarily or through regulation. Emitters who can emit below the base rate can sell their credits to those who want to emit above their apportioned base rate. In 'cap and trade', the regulator sets a cap (a limit) on overall emissions and allows trading among polluters.

6.8 KEY WORDS

Market Based Instruments : Indirect instruments which provide rewards for polluters to do what is perceived to be in public interest.

Pollution Fees : The payment paid by the polluter to a regulatory body per unit of pollution emitted.

Pigouvian Fee : It is an emission fee exactly equal to the aggregate marginal damage by emissions when evaluated at the efficient level of pollution.

Subsidies : Subsidies refer to what the public authority pays a polluter for every ton of emission reduced from a bench mark level.

Tradable Permit : Allows polluter to buy and sell the right to pollute. Pollution control is expressed by holding the number of emission permits.

Offset Trading : Offset trading targets the new firms to pay existing firms to reduce their emission below standard so as to offset the added emissions of the new firms.

Emission Rate Trading : 'Emission trading' is expressed in terms of the rate that a pollutant constitutes in total output.

Cap and Trade : The regulator sets a cap (a limit) on overall emissions and allows trading among polluters. This system is more centralised. Trading involves a price or value on a permit to pollute.

6.9 SOME USEFUL BOOKS AND REFERENCES

1) Barry C Field & Martha K Filed (2017). *Environmental Economics: An Introduction*, McGraw Hills, USA.

2) Kolstad, C D (2016). *Intermediate Environmental Economics*, Oxford University Press, New Delhi.

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6.10 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Pollution tax/fee, market permits, subsidies and liabilities

2) P = MS (X) = – MC (X) where X stands for quantity of pollution.

3) $MAC_1 = MAC_2 = MAC_n$

4) Pigouvian fee is defined as 'MS from pollution at its optimal level'. If we are not at the optimum level of pollution, Pigouvian fee will be neither the current MC of pollution control nor the MD from pollution. Hence, the Pigouvian is not any emission fee but just the MS from pollution at the optimal pollution level. In case of pollution fees or tax, firms will abate pollution up to the point where MAC is equal to emission fee.

Check Your Progress 2

1) The public authority would pay a polluter an amount for every ton of emission it reduced from a bench mark level.

2) Offset trading, emission rate trading and 'cap and trade'.

3) If a firm inflicts damages on someone, it must be held responsible for this act and must compensate for it.

UNIT 7 IMPLEMENTATION OF ENVIRONMENTAL POLICY*

Structure

7.0 OBJECTIVES

After reading this unit, you will be able to:

- distinguish between 'policy' and 'Act';
- state the important features of 'national environmental policy'(NEP), 2006;
- present an overview of 'evolution of environmental policy' in India;
- discuss the major Acts of environmental significance enacted in India up to the year 2000;
- bring out the thrust behind the 'wildlife protection Act', 1972;
- enumerate the major amendments made in the Air Prevention and Control of Pollution Act of 1981;
- explain the provisions of legislative initiative for environmental protection initiated in the post-2000 years in India; and
- write a note on the measures initiated for monitoring the implementation of environmental issues in India.

7.1 INTRODUCTION

Environmental policy is an important aspect of environmental economics. This is because while environmental economics deals with the repercussions of economic activities on environment and natural resources, to cope with the impacts of activities on the environment, we need environmental policies, legislations/Acts and implementing authorities. In this context, the previous

* Dr. Dipti Nayak and Prof. S. P. Singh, I. I. T. Roorkee.

two units (Units 5 and 6) discussed the mechanisms, tools and techniques to control the harmful activities to limit the impact on the systems and subsystems of the environment. In this unit, we shall learn about different environmental legislations and Acts in India.

The different environmental laws/acts in India can be distinguished for laws framed: (i) before independence, after the early years of independence and the early decades of independence and (ii) the later ones which were required due to change in the mode of production/technology. Many laws were framed even in the ancient times (e.g. laws on conservation of forest prescribed in different *granths* and holy books). Examples of such Acts, which were in place before independence, are the Shore Nuisance (Bombay and Kolkata) Act of 1853, the Oriental Gas Company Act of 1857, the Bengal Smoke Nuisance Act of 1905, Bombay Smoke Nuisance Act of 1912, etc. Examples of such Acts in the post-independence include the Factories Act 1948, Orissa River Pollution Prevention Act 1953, River Boards Act 1956, Prevention of Cruelty on Animals Act 1960, Maharashtra Prevention of Water Pollution Act 1969, The Wildlife (Protection) Act 1972, The Water (Prevention and Control of Pollution) Act 1974, The Forest (Conservation) Act 1980, Air (Prevention and Control of Pollution) Act 1981, Environment (Protection) Act 1986. In more recent times, we have Public Liability Insurance Act 1991, National Environment Tribunals Act 1995, National Environment Appellate Authority Act 1997, Recycled Plastic Manufacture and Usage Rules 1999, Municipal Solid Wastes (Management and Handling) Rules 2000, The Battery (Management and Handling) Rules 2000, Ozone Depleting Substances (Regulation and Control) rules 2000, Biological Diversity Act 2002, etc.

There is a distinction between a 'policy' and an 'Act'. A policy is a broad guideline or blueprint of a course of action. It helps in making decisions by bureaucrats, administrators and planners who are supposed to implement policies in practice. It could therefore be defined as 'a purposive course of action to deal with a matter or subject of concern'. A policy, however, needs legislative backing to be enacted as an Act. An act is thus a legal document framed on a particular matter [either by the parliament (for national laws) or state legislature (for state laws)] and invariably has provisions for punitive damages including imprisonment for its violation. Before an Act is passed and notified, a 'proposal' is proposed as 'draft'. It is presented as a 'bill' to the legislative body which is debated, amended and then notified to become an Act for implementation. A 'bill' is therefore demand driven abetted by push factors like civil society, lobbyists and stakeholders.

7.2 EVOLUTION OF ENVIRONMENTAL POLICY

During 1970s, the world raised to accord recognition to the notion of 'one earth' on matters of pollution, acid rain, degradation of environmental quality, deforestation and consequences of nuclear tests. The scientific findings of literary writing like 'Silent Spring' (1962) by Rachael Carson and the 'Limits to Growth' (1972) by Meadows and Meadows led to the

foundation of the first UN Conference on Environment (held in Stockholm in 1972). There was diverse opinion on concerns of environment. This ranged between the two extremes of 'development as the cause of environmental disruption' (put forward by the representatives of industrialised countries) to the view that 'poverty as the biggest polluter' (put forward by the block of developing countries). In effect, and in their limits, the two extreme viewpoints drew reference to the concepts of 'sustainable development' and 'inclusive development' respectively. The oil crisis of 1973 and 1979 and the 'Chipko movement (1973) 'highlighted the need to focus on country-specific environmental policies. To prepare for the Stockholm conference, India had established a committee (named 'National Committee on Environmental Planning and Coordination') for addressing different environmental issues. This led to the inclusion of issues of environmental concern for policy, for the first time, in the fourth 5-year plan (1969-1974) of India. Besides setting the tone for a political agenda, Article 48A was introduced in the constitution of India emphasising the need to protect forest and wildlife in India. To have a regulator for monitoring the forest issues, the 'department of forest' was created in 1980 (separating it from its predecessor viz. 'department of environment, forest and wildlife'). A separate 'Ministry of Environment and Forest' (MoEF) was subsequently established in 1985. Globally, the issue of 'development' [as put forward in the two extremes of Stockholm conference (1972)] was changed to 'alternative development' in the Nairobi conference held in 1982. This gave rise to the concept of 'sustainable development' adopted in the 1983 UN conference on 'World Commission on Environment and Development'. The tragic case of Bhopal gas incidence (1984) along with the international scenario obtaining on air and water pollution influenced the need to adopt a specialised environmental policy in India. Many other international conferences and conventions [e.g. Rio conference, 1992; United Nations Framework Convention on Climate Change (1992), Kyoto Protocol (1997), Millennium Development Goals (MDGs) (2000), Convention on Biological Diversity (2002)] also influenced for the policy thrust on issues of 'biodiversity, ecosystems and climate change' in India.

The 'national conservation strategy and policy statement' on 'environment and development' (1992) was one of the first attempts in India to develop a policy framework for environmental protection. However, the first 'national environmental policy' (NEP) was adopted in 2006. Prior to this policy, there was no 'integrated and comprehensive' policy for environment. Instead, there were some sectoral policies (e.g. national agricultural policy, national water policy, national forest policy, etc.). In some cases, these sectoral polices conflicted with each other in achieving their objectives. There was therefore a crucial need for a comprehensive policy on environment. The NEP 2006 is thus an important initiative in this direction.

Several instruments are used to implement the environmental policy for achieving its intended goals and objectives. In the preceding units, we have discussed economic incentives and command and control approaches as policy instruments. Constitution of India (under Articles 48-A and 51-A) makes provision for protection and improvement of natural environment and prescribes duties of each citizen to protect the environment including forest,

rivers and wildlife. Existing legislative framework for environment is broadly contained in six main Acts viz. (i) Wildlife (Protection) Act 1972, (ii) Water (Prevention and Control of Pollution) Act 1974, (iii) Forest Conservation Act 1980, (iv) Air (Prevention and Control of Pollution) Act 1981, (v) Environmental Protection Act 1986, and (vi) Biodiversity Act 2003. Besides these six major Acts, we also have the 'ozone depleting substances (regulation and control) rules, 2000'. In the subsequent section of the unit, we shall briefly note the major features of these Acts under two heads viz. Acts before the year 2000 and Acts after the year 2000.

Check Your Progress 1 [answer within the space given in about 50-100 words]

1) Differentiate between a 'policy' and an 'Act'.

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2) List some laws on environment which were in existence before India's independence.

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3) State the important features of NEP, 2006.

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4) Indicate the significance of two dimensions on development which emerged from the Stockholm's UN Conference on Environment, 1972.

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7.3 ENVIRONMENTAL ACTS IN INDIA BEFORE 2000

This section provides a brief outline of 5 major Acts enacted in the years: 1972, 1974, 1980, 1981 and 1986.

i) Wildlife Protection Act, 1972: There were already in place some wildlife laws in the British India (e.g. Wildlife Protection Act 1887, Wild Birds and Animal Protection Act 1912, and Indian Forest Act 1927). After independence, one of the flagship laws to be enacted in the area of forest and wildlife conservation is the 'Wildlife (Protection) Act 1972'. Originally, the Act of 1972 specified only certain aspects of wildlife protection. These are: (i) definition and protection of wild lives, (ii) formation of sanctuaries and national parks, (iii) prohibition activities, (iv) rules related to trade and commerce in wild animals, (v) animal products and trophies and (vi) prevention and detection of offences to wild lives. In other words, the broad objectives of the Act were in respects of:(i) conservation, protection and management, (ii) prohibiting specified human activities, (iii) regulation of trade of wild lives and (iv) management of zoos. The Act has since been amended several times to make for certain specific provisions and enhance punishment and disincentives for violation. For instance, it was amended in 1982 to allow for scientific research and management. A later amendment in 1986 allowed for 'trade and commerce in wildlife'. The Act was again amended in 1991 to cover for the protection of wild plants and introduce measures for harmonising the needs of the tribal and forest dwellers (with the need for the protection and conservation of wildlife). In another amendment in 1993, focus was shifted to ensuring the 'ecological and environmental security' by emphasising on 'no alteration of boundaries/ national park/sanctuaries' except on the recommendation of the National Board for Wildlife. The Act was more recently amended in 2006 to set up a 'National Tiger Conservation Authority' (NTCA).

ii) Water (Prevention and Control of Pollution) Act, 1974: The Act is significant in establishing regulatory authorities [viz. Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB)] for monitoring and enforcing 'water pollution means and measures'. Specifically, the objectives of the Act are to: (i) advise the central and state governments on prevention and control of water pollution; (ii) coordinate activities and programmes and provide technical assistance and guidance to governments; and (iii) set standards, enforce implementation and impose penalties for non-compliance from the polluting units and agencies. Theoretical concepts in environmental regulation like 'liability or precautionary', 'the polluter pay' and 'intergenerational equity' are enshrined in the Act. An amendment to the Act in 1988 empowered the regulatory boards to close a defaulting industrial unit by an administrative order besides imposing stringent penalties. However, the case of Ganga River and tanneries located in its

bank in Uttar Pradesh, West Bengal and some other states, shows that the effectiveness of enforcement/implementation continues to be weak.

iii) Forest Conservation Act, 1980: The Act is a successor to the colonial Forest Act of 1927. It aims at reducing deforestation, conserving forest and related assets. The Act places restrictions on converting reserved forest land into other land use like 'non-forest purposes' which include cultivation of tea, coffee, spices, rubber, palms, oil-bearing plants, horticultural crops and medicinal plants. But this provision has not been properly followed giving rise to its misuse. To rectify this anomaly, the scope of the definition of the term 'non-forest purposes' was amended to incorporate strict provisions against violators.

iv) Air (Prevention and Control of Pollution) Act, 1981: After the UN conference on 'Human Environment' (Stockholm, 1972), in order to implement its decisions, India enacted the 'Air (Prevention and Control of Pollution) Act, 1981'. The Act made provisions for establishment of regulatory boards for the prevention, control and abatement of air pollution. It also assigned powers and functions to such boards on air pollution matters. The Act entrusted the two pollution regulatory boards (viz. the CPCB and SPCB) with the additional responsibility of regulating the air pollution related matters. The experience of implementing the Act led to an awareness on some implementation difficulties. These difficulties were in the areas of both administrative and practical dimensions pointing out towards the lack of effectiveness in implementing the provisions of the Act. In order to remove these difficulties, the Act was amended in 1987. The amendments made are in respect of the following.

    i) The CPCB was empowered to exercise the powers and perform the functions of a SPCB in specific situations, particularly when a SPCB fails to act and comply with its directions.

    ii) It was made obligatory on the part of an industrialist (or entrepreneur) to obtain the approval of the relevant Board for environmental clearance at the time of establishing the industrial plant itself.

    iii) The Boards were empowered to obtain information regarding discharge of pollution in excess of specified standards by the industries operating even outside the air pollution control areas.

    iv) To effectively prevent air pollution, punishments provided for in the Act were made stringent.

    v) To elicit public cooperation, any citizen was empowered to complain on violations of the Act.

    vi) The Act was made applicable to all the industries causing air pollution irrespective of any consideration. Earlier, there was a schedule in place which granted exemptions to some industries. This was removed in the amendment.

vii) The Boards were empowered to direct any person, officer or authority for the closure of an offending establishment (including discontinuing of supply of services such as water and electricity).

viii) For increasing their financial resources, the Boards are empowered to raise loans and issue debentures.

v) The Environmental Protection Act, 1986: This Act too (like the Water and Air Acts) is an outcome of India's participation in the Stockholm Conference, 1972. The Act aims at taking steps to provide for the protection and improvement of environment. In effect, this Act also makes provision on the 'prevention of hazards to human beings, other living creatures, plants and property'. The consequences of Bhopal gas tragedy (1984) made a quintessence for the enactment of an 'umbrella act' that can expand the scope of the term 'environment' to bring it in sync with the earlier Acts on 'Water (1974) and Air (1981)'. The Act covers: (i) prevention of discharge of environmental pollutants and handling of hazardous substances and (ii) provide speedy response in the event of accidents threatening environment. It advocates punishment to those who endanger human environment, safety and health.

The Act is applicable to the whole of India but has certain limitations on the definition of the term 'pollution'. For instance, it does not cover 'noise pollution, congestion, traffic, deforestation, degradation of the ecosystem, thermal pollution in the form of heat, radiation, etc.'. It only considers environmental pollutants in the form of 'substances' i.e. solid, liquid and gas. The Act empowers the central government to set national standards on: (i) the quality of the environment including standards for emissions and effluent discharges, (ii) regulate industrial locations, (iii) manage hazardous substances and (iv) disseminate information on pollution. It has the power to close, prohibit or regulate any such industries which pollute beyond the set standards. If a person/industry violates the standards set, liability extends to 5 years in prison or a fine up to rupees 1 lakh. An additional fine of up to Rs. 5000 can be imposed for more violations with the prison term extended up to 7 years.

Check Your Progress 2 [answer within the space given in about 50-100 words]

1) Bring out the thrust behind the 'Wildlife Protection Act', 1972.

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2) In which particular respect, the Water Act, 1974 significant? Despite this, what can you illustrate to indicate its weak implementation?

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3) State any three important amendments made into the Air Act of 1981 in order to improve the implementation of the Act.

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4) State the two limitations of the 'Environment Protection Act, 1986'.

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7.4 ENVIRONMENTAL ACTS IN INDIA POST-2000

The section briefly reviews major post-2000 developments in environmental Acts in India. The major ones in this respect are: (i) Ozone Depleting Substances (Regulation and Control), Rules, 2000; (ii) Biodiversity, Act 2002; (iii) Forest Right Act, 2006; (iv) Environmental Impact Assessment Notification, 2006; (v) National Environmental Policy, 2006; and (vi) National Green Tribunal (NGT) Act, 2010. Of these, the 'Ozone Depleting Substances (Regulation and Control), Rules, 2000' is one important initiative which comes under the overarching ambit of 'Environment Protection Act 1986'. The rule gives an exhaustive list of 95 ozone depleting substances. It prescribes that: (a) those engaged in producing, using or dealing/trading (export and import) with ozone depleting substances [like CFCs, Methyl Chloroform, Halon, Methyl bromide, Carbon tetrachloride etc.] must be registered; and (b) they should maintain records about the quantity of production, use, sale, purchase, trade (export/import). The rules prohibit new investment on ozone depleting substances. The rules are in adherence to the Montreal protocol (1987, 1990 and 1992) on substances that deplete the ozone layer.

Biodiversity Act, 2002: This legislation was enacted to ensure the compliance of the international 'Convention on Biological Diversity (CBD)', 1992. The Millennium Ecosystem Assessment (MEA, 2005) finds that India is home to mega diversity hot spots, whose preservation is of utmost concern. The Act, therefore, aims at conserving biological resources and related knowledge. Under the Act, a National Biodiversity Authority (NBA) is established. The main functions of the authority are to: (i) advise the government on 'notifications of threatened species, designating institutions as repositories for different categories of biological resources and exempt certain biological resources which are traded as commodities'; (ii) encourage establishment of state biodiversity boards; (iii) build up a database and documentation system; and (iv) create awareness through training programmes on intellectual property rights.

Forest Rights Act, 2006: The act was formulated to undo the historical injustice to the scheduled tribes and other traditional forest dwelling communities (by not recognising their rights on forest land since colonial regimes). It covers such people who have been living in forest/protected areas like sanctuaries and national parks at least for three generations (one generation comprising of a period of 25 years) prior to 13 December 2005. It recognises the rights and occupation of such persons on forest land, non-timber forest resources (e.g. bamboo, stumps, cane, honey, wax, lac, tendu leaves, roots, medicinal plants, etc.). The Act also prescribes responsibility and authority for the sustainable use and conservation of biodiversity so as to maintain ecological balance while simultaneously ensuring the livelihood and food security to forest dwellers. It addresses the insecurity of access rights of forest dwellers including those who were relocated forcefully due to state development interventions.

Environmental Impact Assessment Notification, 2006: The notification is to serve as a tool to minimise the negative impacts of newly established industries, firms or other infrastructure and development projects. The notification classifies developmental projects into two categories, A and B, based on criteria like: (a) threshold capacity of the project, (b) pollution potential and (c) prior environmental clearances. The environmental clearances are given either directly by the Ministry of Environment and Forest (MEF) or the respective State Environmental Impact Assessment Authorities (EIAA). The notification is issued under the Environment Protection Act, 1986. It provides different stages of impact assessment like: (a) screening (i.e. determining whether the project requires impact assessment report or not) and (b) scoping (i.e. determining the detailed and comprehensive terms of reference). The notification provides for addressing the environmental issues and concerns through public consultation and appraisal of project proposals.

National Environmental Policy, 2006: This policy is an umbrella policy fulfilling the principles of polluters pay, equity and precautionary principle for achieving the goals of sustainable development. Let us understand a little more about these principles. Precautionary principle relates to 'taking appropriate caution in advance' in the presence of uncertainty or

apprehension. This approach is taken where there are credible threats of serious or irreversible damage to environmental resources. Likewise, the 'polluters pay principle' is also a part of sustainable development guide focusing on 'internalisation of externalities in the production process'. The basic thrust of the principle is that 'whosoever is polluting, they must bear the cost of pollution and pay/prevent/manage for every harm done to others'. It is a kind of compensation to victims who suffer because of pollution originating from the production activities of firms/industries. The overarching features of NEP therefore include: (i) doctrine of public trust, (ii) securing the tribal rights over forests, (iii) right to development, (iv) decentralisation, (v) integration of environmental concerns with development activities and (vi) stakeholders participation. It therefore addresses the key challenges such as: (i) conservation of critical environmental resources; (ii) livelihood security of the poor; (iii) judicious use of environmental resources; (iv) integration of environmental concerns in economic and social development; (v) efficiency in environmental resource use; and (vi) enhancement of resources for environmental conservation. These policy objectives were envisaged to be achieved by appropriate strategies and actions like: (i) revisiting the existing policies and legislative framework, (ii) initiating regulatory reforms in terms of establishing/enacting new institutions and legislative framework, (iii) identifying emerging areas for new legislation and (iv) conserving environmental resources by addressing the problems of a wide array of areas [e.g. land degradation, issues of desert ecosystems, forest and wildlife, biodiversity, groundwater, wetlands, mountain ecosystems, coastal resources, pollution abatement, conservation of heritages, climate change, etc.].

National Green Tribunal (NGT) Act, 2010: NGT is a specialised environmental court dealing with environmental litigations. After its establishment, India has become the third country to have a separate legal entity (after Australia and New Zealand) to provide justice on pending environment related cases. The members of NGT have expertise either in judicial/legal experience or environment with technical knowledge. NGT functions under the Supreme Court, has jurisdiction over all civil cases relating to environment and has powers to order relief and compensation to victims of pollution and other environmental damage, including accidents occurring while handling hazardous substances.

7.5 ISSUES OF IMPLEMENTATION

Policy implementation refers to the actions to be initiated 'after a bill becomes a law'. Implementation is the toughest task in the entire policy cycle consisting of: (i) problem identification, (ii) agenda setting, (iii) policy formulation, (iv) policy legitimisation, (v) implementation and (vi) evaluation. It consists of a set of actions to carry a policy into effect by applying them to the target population so as to achieve its goal. Policy implementation is, therefore, a function of: (i) the agencies and officials involved, (ii) the procedures they follow, (iii) the techniques or tools they employ and (iv) the political support and opposition that they encounter. For instance, currently, CPCB is the regulating body for ensuring environmental

protection in water, air, noise and waste management. It issues directions to industries (and district magistrates/commissioners) for ensuring compliance on decisions of CPCB (or allied bodies) on different environmental issues. On the basis of pollution emission, the MoEF (in 2016) has reclassified industries into four groups viz. green, yellow, white and red for promoting 'ease of doing businesses'. These categorisations have been made based on a pollution index which takes into account four variables viz. (i) emissions (air pollutants), (ii) effluents (water pollutants), (iii) hazardous wastes and (iv) consumption of resources. The Pollution Index (PI) of any industrial sector is a number between 0 to 100; the higher the value of PI, the greater the degree of pollution load from the industrial sector. As per this classification, industries falling under 'white industries' do not have to seek environmental clearance for setting up their business. Sector specific guidelines for environmental safety norms are available. For instance, in telecom sector, for installation of a mobile tower, CPCB has prepared guidelines for safe installation of mobile phone towers and safe exposure limits for electromagnetic radiation from these towers. Likewise, air pollution norms and noise limits for diesel generator (DG) sets are also prescribed by the CPCB. Such norms are prescribed for cement industry, automobile industry, fertiliser industry, textile industry, pulp and paper industry. These are done with due consultation with the respective association and regulators.

However, enforcement of a policy/law in the targeted area/case is not an easy task. For instance, let us take the recent example of Forest Right Act (FRA) 2006. Although this Act has been enacted as far back as 2006, till now its implementation is yet to be streamlined. In early 2019, the Supreme Court (SC) directed the state governments to evict the encroachers considering them as illegal forest dwellers. However, the Act was meant to recognise the rights of schedules tribes and other forest dwellers on forest land for their livelihood needs. But, getting a legal right involves an official process of settling their claim on the forest land. Considering the long period of 13 years after the Act became a law, the rightful claim of forest dwellers had not yet been settled. The SC therefore also sought the 'action taken report' (ATR) by the state government. The order of the SC resulted in a state wide protest by forest dwellers. Following this, the 'ministry of tribal affairs' (MoTA) intervened with a review petition to implement the FRA. All this happened because of the government's inaction to settle the claims of 'STs and other forest dwellers' in many parts of the country. The SC had to again order for the submission of documents and the ATR by governments within two weeks. Some of the states like Assam, Odisha, Andhra Pradesh, Telangana, MP, Karnataka, UP and Kerala failed to submit the documents and as a result the SC imposed punitive measures on these governments with a penalty of rupees fifty thousand each. On top of all these, during the earlier hearings of the case in 2018, the nodal agencies like MoTA and the apex monitoring body [the Ministry of Environment, Forest and Climate Change (MoFCC)] were either not present or did not defend. These instances speak of how carelessly the policies are implemented. We can, therefore, deduce that success of policy implementation depends on various aspects. Besides, conceptual, political and administrative factors, it also mainly depends on the

'coordination and cooperation' among the line departments and 'parties and institutions' involved.

7.6 LET US SUM UP

India has many Acts and policies to safeguard environment. A policy is broad guidelines (or blueprint) of a course of action for making decisions. They are useful in implementation for bureaucrats, administrators, governance body and planners. It is therefore a blueprint for purposive course of action to deal with a problem or matter of concern. An Act, on the other hand, is a legally binding legislation with statutory backing. Environmental policies and Acts in India are greatly influenced by the international policies and commitments. MoEF is the nodal agency in formulating environmental policies. CPCB and SPCBs are the implementing bodies. Although we have many Acts and policies on environment, the implementation part is weak. This is classically illustrated by the failure of authorities in controlling the pollution on the banks of the river Ganges in India.

7.7 KEY WORDS

Policy : A purposive course of action followed by an actor (or set of actors) to deal with a problem or matter of concern.

Act : An Act is a legally binding legislation or law. It is enacted by either the parliament or a state legislative assembly with their jurisdiction extended either to the whole nation or the particular state.

Bill : The draft of a proposed law presented for debate in either a house of parliament or state assembly.

MoEF : The nodal ministry 'for planning, promotion, co-ordination and supervising the implementation' of India's environmental and forestry policies and programmes.

CPCB : A statutory organisation, constituted under the Water (Prevention and Control of Pollution) Act, 1974. It is entrusted with the powers and functions to prevent and control air and water pollution.

Environmental Protection Act, 1986 : An Act passed in 1986 with the objective of providing for the protection and improvement of the environment. It empowers the central government to establish authorities charged with the mandate of preventing environmental pollution in all its forms and to tackle specific environmental problems that are peculiar to a region.

7.8 SOME USEFUL BOOKS AND REFERENCES

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2) Shyam, D. and Armin, R. (2002). Environmental Law and Policy in India: Cases, Material and Statues, Oxford University Press New Delhi.

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7.9 ANSWERS/HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) List the Acts of years 1853, 1857, 1905 and 1912 from Section 7.1.

2) An Act has legislative or statutory backing having been passed by a state assembly or national parliament. It has legal binding. Violators are punishable with fine and imprisonment. A policy is a guideline or blueprint of course of action for implementation of an Act. A policy document is thus a sequel to an Act.

3) Public trust, tribal right, right to development, decentralisation, stakeholder participation, etc.

4) The conference underlined the importance of pursuing 'sustainable development' agenda for developed countries and 'inclusive development' agenda for developing countries. The former underscored the importance of protecting environment'' for future generations (in due regard to its 'significance' to production on the one hand and 'limits to perform its absorptive role of environmental effluents on the other) and the latter the significance of not allowing the benefits of growth to 'bypass the underprivileged sections of the society'.

Check Your Progress 2

1) The original un-amended Act laid thrust on four areas. These are: (i) conservation, protection and management, (ii) prohibiting specified human activities, (iii) regulation of trade of wild lives and (iv) management of zoos.

2) Establishment of regulatory boards like CPCB and SPCB, and their subsequent empowerment by amendments, could be considered significant for legislative initiatives. But the episodes of Ganga pollution, by allowing tanneries to exist and pollute the river, suggests the lack of implementation of the Act by these boards.

3) (i) Making it obligatory for an industrialist to obtain environmental clearance from a Board before the setting up of the industry, (ii) punishments provided for violation being made more stringent and (iii)

removal of a Schedule allowing for exemptions to some industries with effect from the amendment.

4) (i) It does not cover 'noise pollution, congestion, traffic, deforestation, degradation of the ecosystem, thermal pollution in the form of heat, radiation, etc.'. (ii) It only considers environmental pollutants in the form of 'substances i.e. solid, liquid and gas'.