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Enviromental Economics

SEMESTER-III

ECONOMICS

BLOCK- 2

KRISHNA KANTA HANDIQUI STATE OPEN UNIVERSITY

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COURSE INTRODUCTION

Environmental Economics is the first course of third semester of the M.A. in Economics programme of this University.This course deals with issues related to enviroment such as nature, scope and significance of enviromental economics, renewable and non-renewable resources, property rights, enviroment and economic development, market failure and externalities etc. So this course basically covers the relevance of these issues of enviroment for a student doing post graduation in Economics and enables the learners with various new knowledge and ideas of Enviromental Economics. This course comprises of 15 units and has been divided into two blocks. The first block comprises seven units and the second block comprises eight units.

BLOCK INTRODUCTION

This is the second block of the course and comprises of seven units. The 9th unit of this course shall discuss the concept and indicators of sustainale development. Significance and Policies of sustainable development and related concepts of sustainable development will be discussed in this unit. As enviromental accounting is considered as one of the important aspect of enviromental economics, it is included in unit10 of the course along with enviromental impact assessment.

There are different instruments of enviromental protection. For better undestanding of the learner, these insuments are catagorised in to two braod catagories as instruments of enviromental protection I and instrument of enviromental protection II and are included in unit 11 and unit 12 respectively. The relation between enviromental protection and economic development is included in unit 13. The relation between these two will be discussed in relation to India. Global initiatiative

towards enviromental issues such as global convention for enviromental conservation, concept of common but differentiated responsibilities, cause of non-cooperative behaviour among north and south, global enviromental issues are included in unit 14 and unit 15.

While going through a unit, you will notice some along-side boxes, which have been included to help you to know some of the difficult, unseen terms. Again, we have included some relevant concepts in “LET US KNOW” along with the text. And, at the end of each section, you will get “CHECK YOUR PROGRESS” questions. These have been designed to self-check your progress of study. It will be better if you solve the problems put in these boxes immediately after you go through the sections of the units and then match your answers with “ANSWERS TO CHECK YOUR PROGRESS” given at the end of each unit.

UNIT- 9 : SUSTAINABLE DEVELOPMENT

UNIT STRUCTURE

9.1 Learning Objectives

9.2 Introduction

9.3 Concept of Sustainable Development

9.4 Indicators of Sustainable Development

9.5 Significance and Importance of Sustainable Development

9.6 Policies for Sustainable Development

9.7 Related Concept of Sustainable Development

9.8 Let Us Sum UP

9.9 Further Reading

9.10 Answer to Check Your Progress

9.11 Model Questions

9.1 LEARNING OBJECTIVES

After going through this unit, you will be able to

- understand the meaning of sustainable development.
- understand the indicators of sustainable development.
- know the significance and importance of sustainable development.
- know the different policies regarding sustainable development.
- familiar with some important concepts related to sustainable development.

9.2 INTRODUCTION

The major objectives of development are the satisfaction of human needs and aspirations. In developing countries, huge numbers of people are not able to meet their basic needs and beyond their basic needs these people have legitimate aspirations for an improved quality of life. A country where large numbers of people are not getting basic needs and inequity is endemic always directly depends on ecology. This leads to ecological and other crises. Sustainable development requires meeting the basic needs

of all and extending to all the opportunity to satisfy their aspirations for a better life. Living standards that go beyond the basic minimum are sustainable only if consumption standards everywhere have regard for long-term sustainability. Many people live beyond the world's ecological means. Perceived needs are socially and culturally determined, and sustainable development requires the promotion of values that encourage consumption standards that are within the bounds of the ecological possible and to which all can reasonably aspire. In this unit we will look into the concept of sustainable development, indicators of sustainable development, significance and importance of sustainable development, policies for sustainable development and also some related concepts of sustainable development.

9.3 CONCEPT OF SUSTAINABLE DEVELOPMENT

Sustainable development is one of the most commonly used terminologies since the later part of the 20th century throughout the world. In 1972, a report was published by the Club of Rome regarding exponential economic and population growth with a finite supply of resources. The report revealed that given the business as usual, i.e. no changes to historical growth trends, the limits to growth on earth would become evident by 2072, leading to 'sudden and uncontrollable decline in both population and industrial capacity'. This was the thought that forced countries of the world to think about sustainable development in organized way. In 1983, the United Nations General Assembly realized that there was heavy deterioration of the human development and natural resources. The *World Commission on Environment and Development (WCED)* organized countries to work and pursue sustainable development together and the United Nations decided to establish Brundtland Commission, which defined sustainable development later on.

It should be mentioned here that in 1977, John Hartwick proposed a rule for ensuring non-declining consumption through time, in the case where an economy made use of a non-renewable resource in its economic process. Hartwick showed that, so long as the stock of capital did not decline

over time, non-declining consumption was also possible. The stock of capital could be held constant by reinvesting rents from non-renewable resource extraction in man-made capital. Hartwick's rule assumes that man-made capitals and natural capitals are to be perfect substitutes for each other. However, the problem is that man-made capitals and natural capitals are not nearly substitutable as Hartwick suggested.

Coming back to concept of sustainable development, environmentalists try to define the sustainable development based on their own understanding. However, most of the definitions are built upon the view expressed by the Brundtland Commission (1987) in the report, *'Our Common Future'*, which defines sustainable development as "*development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs*." The definition covers three basic ideas-*development, needs* and *future generation*. Development is often confused with growth. On the one hand, growth is an expression for quantitative expansion of economic system. Development, on the other hand, is a qualitative concept incorporating notions of improvement and including cultural, social and economic dimensions.

The use of the concept 'needs' in the definition, is connected to the distribution of natural resources. Elsewhere in the Brundtland report, sustainability is defined as '*meeting the basic needs of all and extending to all, the opportunity to satisfy their aspirations for a better life'*. Economic growth has converted luxuries to need for some people while for the poor even the basic necessities are not affordable. Meeting the needs of all, therefore involves heavy environmental costs. Need also means redistributing natural and economic resources. Hence it is a moral issue.

The definition concerns for the welfare of the future generation as much as the present generation. The report says, *"In essence, sustainable development is a process of change, in which exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations."* The definition itself provides clues to design the process of development, choice of technology,

the kinds of property rights system, institutional structure to manage the resources and the expected social order.

There are three basic components of sustainable development: *Economic, Social and Environmental*. The three components are interdependent. The economic component of sustainability requires that societies pursue growth paths that generate optimal flow of income while maintaining their basic stock of manmade capital (machines, buildings, roads etc.), human capital (stock of knowledge and skills) and natural capital (all renewable and non-renewable resources or any natural assets yielding a flow of ecological services with economic values over time). The economic sustainability also requires internalizing all costs including the environmental costs associated with production and consumption. There are three basic goals of an economic system, viz. (i) increasing production of goods and services, (ii) satisfying basic needs or reducing poverty, (iii) improving equity.

The social dimension of sustainable development is built on the twin principles of justice and equity. For a development path to be sustainable over long period of time, wealth, resources and opportunity should be equitably shared. All citizens should have access to minimum standards of security, human rights, and social benefits such as food, health, education shelter and opportunities of self-development. Social equity implies equal opportunities to all for education and for making productive contribution to society. These have to be ensured to achieve the social goals of (i) cultural diversity, (ii) social justice, (iii) gender equality, and (iv) public participation.

Sustainability is an in-built feature of natural systems provided that human interference is absent or minimized. It relates to the capacity of a system to maintain a continuous flow of whatever each part of that system needs for a healthy existence. Human use of environmental resources and interference with environmental systems disturbs this in-built capacity which can make a system unsustainable. Therefore, the environmental components require sustainable resource use and maintenance of stock of natural capital. That is the environment should be able to perform its three function efficiently and uninterrupted so that ecological stability and resiliencies are not affected.



CHECK YOUR PROGRESS

Q 1: Name the organization that brought into the common use of the terminology 'sustainable development'.

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Q 2: What are the three basic ideas that definition of sustainable development covers?

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Q 3: What is the difference between growth and development?

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Q 4: What are the three basic components of sustainable development?

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9.4 INDICATORS OF SUSTAINABLE DEVELOPMENT

Indicator means the variables that uses to measure knowledge which support for policy analysis and decision-making process. Sustainable development includes economic, social and environmental attributes as already discussed in the section 9.3 of this unit. Therefore, the corresponding sustainability indicators will also have to account for all of them. A large number of product and service specific and people related indicators could be developed in this regard.

Weak and strong sustainability come into the picture when indicators of sustainability are tried to develop. Weak sustainability assumes that natural capital and manufactured capital are essentially substitutable and considers that there are no essential differences between the kinds of well-being they generate. The only thing that matters is the total value of the aggregate stock of capital, which should be at least maintained or ideally

increased for the sake of future generations. Strong sustainability demonstrates that natural capital cannot be viewed as a mere stock of resources. Rather natural capital is a set of complex systems consisting of evolving biotic and a-biotic elements that interact in ways that determine the ecosystem's capacity to provide human society directly and/or indirectly with a wide array of functions and services.

Defining development indicators with the framework of economic development itself is quite complicated. Defining development indicator is too normative. No single indicator can give a perfect and complete picture about the state of welfare. Regarding social issues, it is very difficult to measure social dimensions. Justice and equity are not easy to define. Likewise, the environmental dimensions invite several new indicators for discussion. Only a few of ecological attributes are quantifiable. Ecological status of aesthetic beauty is not easy to put on any scale or indicator, though some of the environment related factors could be viewed in terms of selected physical indicators. For example, air pollution can be viewed in terms of emission of CO_2, SO_2 or NO_x.

In order to capture all aspect of ecological and environmental changes, three types of indicators can be suggested. These are *pressure indicators, impact indicators and sustainable indicators*. *Pressure indicators* refer to flow variable. They show the development over time or amounts or levels of emissions, discharges, depositions, extraction, and interventions originating from a set of economic activities. These indicators express the burden placed on stock of environmental goods and resources. They can be defined by economic activity or sector or with a spatial dimension that is use of environmental goods and services by a district, region, state or country. *Impact indicator*s reflect the impact of environmental pressure on the receptors, usually in a predetermined region. These indicators include imported trans-boundary pressures. Ideally, they show the development over time of the stock and qualities of environmental goods and resources. Both pressure and impact indicators can be transformed into so called *sustainable indicators* by relating pressure or impact with predetermined reference values. These references try to indicate what is considered to be

a sustainable level of extractions or a sustainable quality level of an environmental good. The latter refers not only to the quantity, but also to the quality of an environmental resource system, that is, the diversity of species of flora and fauna. In that case, the reference is usually a past or a desirable future state of an ecosystem.

It should be recognized that sustainability indicators contain normative valuation in three respects.

- They picture a distance between current and reference values that should be bridged.
- Although the reference values are based on scientific insights, they are inevitably the outcome of personal and societal assessments and preferences. Alternative operational definitions of sustainable development may be conceived and preferences for environmental quality may differ.
- Another valuation problem creeps in while aggregating sustainability indicators to provide adequate information on an environmental system as a whole. In aggregating, the relative weights of the basic indicators have to be established.

9.4.1: Measurement of Sustainable Development

While a variety of sustainability indicators can be serving the purpose of understanding some of the dimensions of environmental and economy in terms of *pressures, impacts and sustainability*, the need for any aggregated index cannot be underestimated. The measures of sustainable developments are classified as project or program and economic wide levels.

(a) Discounted Present Value Benefits

The Discounted Present Value Benefits is project of program level measure of sustainability. In economic theory, it is well understood that any stream of costs and future benefits from an economic activity are better understood only when they are aggregated with certain weights so as to arrive at an aggregate index of overall net benefit. The weights are commonly known as

'discount factors'. One such calculation is the Net Present Value Benefit (NPVB) expressed as:

$$NPVB = \sum B_t \delta_t - \sum C_t \delta_t - \sum E_t \delta_t \geq 0$$

where B_t ,C_t, E_t are annual or any time related stream of benefits, costs, environmental costs respectively; δ stands for the discount factor expressed as:

$(1+r)^{xt}$

where r is the discount rate, t stands for time. As long as the present value of benefit is non-negative, it is sustainable.

But, under sustainability conditions, it is appropriate to value environmental costs and benefits over a long period of time (if not over infinite time). In other words, the corresponding discount rates should be much smaller than the usual social discount rate *r*.

There are two problems of this measure of sustainability. First, if the social discount rate is reduced, capital costs which are generally incurred in the initial period of the projects get over-valued, making capital intensive projects go out the list, though in terms of efficiency they may be better. Second, if the discount rate is reduced, it may affect future investments in the economy and have different implications for ecological and natural resources.

(b) The 'Green' GNP

The general definition of sustainable development adopted here is that every future generation must have the option of being as well off as its predecessor. Discounting is compatible with this if the discount rate is less than the rate of technological progress. Maintaining a constant potential for wealth creation means the maintaining a constant means of production. This includes man-made capital, natural resources, technology and the level of learning (i.e. human capital). A sustainable path has the characteristic that along it this overall productive capacity is not reduced. What we need to know at each moment in time is how much of this productive base we can use up. This is given by environmentally adjusted Net

National Product (NNP) (It is called ENP). NNP is the total income earned by the economy in any year, less an allowance for the depreciation of man-made capital. When is an environmentally adjusted measure of NNP a good measure of sustainable development? First, when all elements of NNP are correctly valued in terms of current economic situation. Second, when this is true in a forward-looking sense too (prices reflect future scarcity). Third, when all depreciation of natural capital is similarly allowed for as well.

Environmentally adjusted NNP is the annual 'pay-off' from total (natural plus man-made) capital stock. ENP can rise through time if this total capital stock rises, and/or as technology improves. How can the total stock of capital be maintained? By following the Hartwick rule: each year, reinvest the rents (price minus marginal cost, known as 'Hotelling rents') from an optimal non-renewable resource extraction plan in new natural or man-made capital. So the indicator is: Is ENP rising or falling? If ENP is falling, then society's sustainable level of income is falling too.

Correct Adjustments to GNP

The analysis presented below is adapted from Hartwick and treats each broad class of the natural capital stock separately. NNP clearly fails as a measure of sustainable development owing to many aspects of natural resource depletion being ignored by the system of national accounts (SNA); whilst expenditure on pollution clean-up actually adds to NNP, with any loss in welfare due to the pollution itself being ignored. Hartwick's optimal adjustments to the national accounts can be summarized as follows.

Non-renewable Resource

Each period, it should deduct the 'Hotelling rents' of natural resource extraction from NNP, assuming all inputs/outputs are valued at their correct shadow prices.

Let C = aggregate consumption, K = stock of man-made capital, S = stock of non-renewable resources, R = current extraction from

S, L = labour (allowed to grow at some rate n), U= utility, ρ=discount rate.

The economic problem is to maximize discounted utility from consumption,

$$\text{Max} \int U(C)\, e^{-\rho t}$$

Subject to: K = F (K, L, R) – C – f(R, S) and ~ = – R

Here a dot represents a rate of change. F (.) is the aggregate production function, and f(.) is the cost of extracting non-renewable resources. Thus, the first equation [i.e. K = F (K, L, R) – C – f(R, S)] says that the rate of change in the man-made capital stock K depends on production less consumption less the costs of extracting resources. The second equation (e.g. ~ = – R) states that the rate of change in the non-renewable resource stock S is equal to annual production R (since there is no growth and implicitly no new discoveries). Then we find that ENP is given by:

ENP= C+ K – [F_R – f_R] R = NNP – [F_R – f_R] R

Where F_R is the marginal product (= price) of R and f_R is the marginal extraction cost. The expression in square brackets is the 'Hotelling rent' and is the correct way of calculating the amount of deduction from conventional NNP, as Hartwick shows. If published average costs are used instead (marginal costs are typically not recorded), then, given that we expect mining companies to be operating where MC>AC, this overstates the correct deduction and understates ENP. If new discoveries are made, so that –R overstates the actual loss of the non-renewable resource, then this should be netted out before the conversion to ENP is made.

Renewable resources

Renewable resources differ from non-renewable resources in that positive growth can occur, subject to the population size and the rate of harvesting. Hartwick models the introduction of renewable resources into the system by including a term in the utility function to represent fish catch (E), so that we have a utility function, U =

U(C, E), where the cost function for fishing (say) is f (E, Z), where Z is the stock of fish. Then,

$\dot{K}$=F (K, L) – C – f (E, Z) and

$\dot{Z}$=g (Z) – E, where g (Z) is the natural growth function, as constraints in the model. When harvesting exceeds the growth rate, $\dot{Z}$ will be negative; when the reverse is true, $\dot{Z}$ will be positive, while $\dot{Z}$ will be zero if harvesting is equal to the growth rate. Hartwick derives the optimal deduction from NNP to allow for depreciation of the renewable resource (fish) as:

$ENP=NNP – (U_E/U_C – f_E) \dot{Z}$

In other words, the change in the stock Z valued by the term in parentheses: this is the ratio of marginal utilities (= price in a competitive market) minus marginal fishing costs. When the harvest rate is less than the growth rate, this adjustment adds to NNP; when harvesting exceeds the growth rate, the adjustment reduces NNP.

A problem recognized by Hartwick is that all the variables in the above equation are calculated at their socially optimal levels, but with open access to renewable resources, these values will not be optimal (e.g. growth rate varies with population size which in turn depends on costs and prices). In general, we would expect the marginal cost to be too high and the price to be too low, as too much effort will be expended in the fishery, for example, under the open access conditions which describe many of the world's fisheries. If this is the case, we will need to regulate effort levels to their optimal amounts and use the prices/marginal costs that then result; or else calculate these optimal prices/costs and use them to value existing reductions in the stock. Notice that, if fish catches remain within the annual growth rate, no adjustment to NNP is necessary (since $\dot{Z} = 0$).

Pollution/environmental amenity effects

Pollution (X) is modeled as a stock which exerts negative effects on production. Production itself adds to this stock:

$$\dot{X} = -bX - \gamma F(K, L, X)$$

Here pollution dissipates at a natural rate b (this could be set equal to zero if the economy generates pollutants for which no assimilative capacity exists, when making ENP adjustments for such pollutants); and is added to by production according to some constant proportion γ. If the only way to reduce pollution is to cut output (an unlikely case in reality), the correct adjustment to NNP is:

$$ENP = NNP - V.\dot{X}$$

Where,

$$V = \frac{-\frac{\dot{U}_c}{U_c} + \rho - Fk}{\gamma Fk}$$

The above expression represents the value of the return on pollution in terms of the return on capital in the economy. As such, it would be difficult to calculate. If in addition we allow for direct pollution abatement activities (represented using a cost function f (b)), we get a simpler adjustment (since now pollution can be controlled directly). In this case, then, ENP is:

$$ENP = NNP - \delta(f_b)/\delta X \cdot \dot{X}$$

which is the change in the stock of pollution (the amount of pollution abatement) multiplied by the marginal cost of pollution control.

Finally, consider the case of pollution entering directly into the utility function, as well as exerting a depressing effect on production. Hartwick actually models changes in the stock of pollution so that U=U(C, $\dot{X}$). This gives the adjustments:

$$ENP = NNP - [((-U_{\dot{S}}/U_c)\dot{X}) - (\delta f/\delta X\tilde{N}\dot{X})]$$

The first term in square brackets is the ratio of marginal (dis)utilities of changes in the pollution stock and consumption (the price of reducing pollution in terms of the value of forgone consumption), multiplied by the change in the pollution stock. This is equal to willingness to pay for pollution reductions times the amount of pollution reduced. The second term in square brackets is the

term found in the earlier equation [i.e. ENP=NNP – $\delta(f_b)/\delta X \cdot \dot{X}$], that is the marginal cost of pollution control times the reduction in the stock. Re-writing above equation makes the nature of the required adjustment clearer:

$$ENP=NNP – [U_{\check{S}} /U_c) + f_b/X] \dot{X}$$

The term in square brackets is positive, but for increases in the stock of pollution ($\dot{X} > 0$), the 'rent' here is negative (since we make negative the expression in square brackets). Thus an increase in pollution (a bad) is treated exactly the same way as a reduction in the stocks of either nonrenewable or renewable resources (goods). Increases in the stock of pollution should lead us to reduce NNP (which is as expected!). Decreases in environmental amenity for reasons other than pollution should be allowed for in the national accounts in a manner analogous to the treatment of the 'amenity' effect of pollution.

(c) Pearce-Atkinson Measure (PAM) of Sustainability

Pearce and Atkinson have developed a sustainability index or indicator which is known as Pearce-Atkinson Measure (PAM) of sustainability. It is economic wide level indicator of measure of sustainability. Following the growth model approach, the savings rate is normally considered to be a good indicator of health of the economy. Higher saving rate will imply better capability of the economy to grow. But under sustainable conditions, both the depreciations of natural resources and man-made capital are to be deducted to arrive at a corrected measure of a sustainable saving rate. Accordingly, the improved measure is stated as:

$$\text{PAM} = \frac{\text{S}}{\text{Y}} - \left(\frac{\delta \text{m}}{\text{Y}}\right) - \left(\frac{\delta \text{n}}{\text{Y}}\right)$$

Where, S and Y are savings and income, ä stands for change, *m* and *n* are man-made capital and natural capital respectively. Only when this PAM is greater than or equal to zero, the economy is sustainable. i.e. for a sustainable economy,

$$PAM = \frac{S}{Y} - \left(\frac{\delta m}{Y}\right) - \left(\frac{\delta n}{Y}\right) \geq 0$$

Improved PAM Formula

One can marginally improve the PAM by incorporating effects of *productivity changes* (mainly due to technological progress) upon the use of investable resources and *change in population* dynamics. The measure is based on aggregate estimates of rate of changes in technical efficiency, population and depreciation etc. The modified PAM is stated as:

MPAM= s*p-n-d-e

where, s= saving rate, p= productivity of new investments, n=rate of population growth. The rate of depreciation of man-made capital (d) and the rate of depletion or degradation of natural capital (e) are expressed as ratios to income. i.e. the economy is sustainable if,

MPAM= s*p-n-d-e e $\geq$ 0

The model assumes that there is no depreciation of human capital, i.e. δh=0, where, h=human capital.

(d) Genuine Saving and Sustainability

The genuine savings (GS) is an indicator that can be used to assess an economy's sustainability. Genuine savings aim to represent the value of the net change in the whole range of assets that are important for development: produced assets, natural resources, environmental quality, and human resources. Generally, development is considered to be sustainable if and only if the stock of capital (wealth) remains constant or rises over time. Thus, the rate of genuine saving can be used to measure sustainability, in that if the genuine savings index (GSI) is positive we are leaving more for future generations; a negative rate of genuine savings, on the other hand, indicates unsustainability. The calculation of genuine savings involves the itemization of a nation's stock of wealth, and an accounting of changes to that stock. The World Bank researchers have defined genuine savings as follows:

Genuine Savings = Production – Consumption – Depreciation of Produced Assets – Depletion of Natural Assets = Gross Domestic Savings – Consumption of Fixed Capital (Depreciation) + Education Expenditure – Air Pollution Costs – Water Pollution Costs – Depletion of Nonrenewable Natural Resources – CO_2 Damage Costs.



CHECK YOUR PROGRESS

Q 5: What do you mean by indicator?

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Q 6: Defining development indicators is quite complicated. Why?

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Q 7: In order to capture all aspect of ecological and environmental changes, what are the three types of indicators of sustainable development?

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9.5 SIGNIFICANCE AND IMPORTANCE OF SUSTAINABLE DEVELOPMENT

The significance and importance of sustainable development are: -

Firstly, sustainable development creates consciousness about environment among the present generations so that the same (greater, if possible) resource can be left for the future generations for their better life. It indicates that sustainable development includes the issue of maintaining equity and justice between present and future generation regarding use of natural resources.

Secondly, sustainable development improves quality of life of human beings and other living beings. Sustainable development includes the issue of resource stock recognition and proper valuation of resources, so that all-round development can be attained within the limited natural resources.

Thirdly, sustainable development tries to balance among economic, social and environmental development. It is some sense of warning to human beings that once imbalance takes place, it will be harmful for all, including human beings, which is known as resiliencies.

Fourthly, sustainable development encourages producers to invent and to use better technology so that output can be produced by using least natural resources. Sustainable development also encourages to producers and consumers to release residuals as least as possible. It indicates efficient use of natural resources.

Fifthly, sustainable development is combined concept of natural sciences and social sciences. It is a multidisciplinary as its contribution is multidimensional to all living beings. Thus, the adverse effects of natural environment are also multidimensional.

Lastly, sustainable development tries to make understand the basic features of natural capital, viz. uniqueness, uncertainty and irreversibility. Sustainable development holds that certain elements of nature are very critical due to their unique contribution to the living beings. Perfect duplication is impossible once such element is damaged or extinct.



CHECK YOUR PROGRESS

Q.8. What kind of consciousness that sustainable development tries to make?

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Q.9. What kind of encouragement does sustainable development provide to producers?

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Q.10. What are the three basic features of natural capital?

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9.6 POLICIES FOR SUSTAINABLE DEVELOPMENT

For sustainable development, it is necessary to set some common policies, such as-

- Setting up tide rules and regulations regarding establishment of industries. Proper implementation of those rules and regulations are necessary for sustainable development, because industrial pollutions are regarded as one of the major sources of environmental pollution.
- Poor people are both agent and victims of environmental degradation. They are agent, because their livelihood directly depends on natural resources and they are victim, because they live in least health and sanitation facilities. Therefore, reducing or eradicating poverty is regarded as one of the important policies for sustainable development.
- Economic incentives should be provided to the industries which use eco-friendly technology in production process. Economic incentives include, imposition of low tax, providing subsidy for the products which are produced by using eco-friendly technology.
- Participation in protection of global environmental efforts is another policy for sustainable development. Greater the participation in protection of global environmental efforts, greater will be the scope of sustainable development.
- It should be provided proper environmental education in schools and colleges so that the mindset of loving and protecting the nature can be created to all levels of people of all the countries in the world.
- Environmental auditing should be made compulsory for all levels of factories/firms including government factories/firms. This will reduce environmental costs of the factories/firms as well as make factories/ firms related people more consciousness on environmental.

9.7 RELATED CONCEPT OF SUSTAINABLE DEVELOPMENT

Some related concepts of sustainable development have been developed in universal level since the last two decades of the last century. The concepts related to sustainable development includes-(i) green growth, (ii) green economy, and (iii) low-carbon development.

9.7.1: Green economy

The concept of 'green economy' is related to ecological economics. The term green economy was first coined in 1989, in the report for the Government of the United Kingdom, prepared by a group of leading environmental economists. It is the economy that aims to achieve sustainable development by including issues like, reducing environmental risks and ecological scarcities. The concept also includes political issues, that the economy should be not only efficient, but also fair. The term was revived in 2008, in the context of discussions on the policy response to multiple global crises. In the context of the financial crisis and concerns of a global recession, the United Nations Development Programme (UNEP) campaigned the idea of 'green stimulus packages' and identified specific areas where large-scale public investment could kick-start a 'green economy'. In the same year, the UNEP launched its Green Economy Initiative to provide analysis and policy support for investment in green sectors and for greening environmentally unfriendly sectors. The United Nations Climate Change Conference held in Copenhagen, in 2009, the UN released an interagency statement supporting the green economy as a transformation to address multiple crises. The statement included the hope that the economic recovery would be the turning point for an ambitious and effective international response to the multiple crises facing humanity based on a global green economy. In 2010, Ministers and Heads of Delegation of the UNEP Global Ministerial Environment Forum in

Nusa Dua acknowledged in their declaration that the green economy concept can significantly address current challenges and deliver economic development opportunities and multiple benefits for all nations.

9.7.2: Green growth

The concept of 'Green growth' is associated with the concept of 'Green economy'. It is the concept that aims to harmonize the economic growth with environmental sustainability, while improving the eco-efficiency of economic growth and enhancing the synergies between environment and economy. The concept has its origins in the Asia and Pacific region. At the Fifth Ministerial Conference on Environment and Development (MCED) held in March 2005 in Seoul, 52 Governments and other stakeholders from Asia and the Pacific agreed to move beyond the sustainable development rhetoric and pursue a path of 'green growth'.

9.7.3: Low-carbon development

The concept of low-carbon development was adopted by the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. At present, the concept of low carbon development is generally expressed using the term Low-Emission Development Strategies (LEDS). The concept is generally used to describe forward-looking national economic development plans or strategies that encompass low-emission and/or climate-resilient economic growth. The LEDS have attracted interest in the climate negotiations as a soft alternative to voluntary or obligatory greenhouse gases (GHG) emission reduction targets in developing countries. The initial proposal to introduce LEDS was put forward by the European Union (EU) in 2008, highlighting how information on planned low-carbon pathways can help to inform the international community about funding needs and priorities and to help gauge the level of global climate change action.



CHECK YOUR PROGRESS

Q 11: Why should tide rules and regulations set for establishment of industries?

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Q 12: Give two examples of economic incentive which use eco-friendly technology.

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Q 13: Write three concepts that related to sustainable development.

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Q 14: Which organization and when the concept of low-carbon development was adopted?

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9.8 LET US SUM UP

- Sustainable development is one of the most commonly used terminologies since the last part of the last century throughout the world. Despite a wide acceptance of the concept of sustainable development, there is no single definition which is all accepted. Development, needs and future generation are the three basic contains of the definition of sustainable development given by the Brundtland Commission. Economic, social and ecosystem are the three basic components of sustainable development.
- Defining sustainable development indicators with the framework of economic development itself is quite complicated. In order to capture all aspect of ecological and environmental changes, three types of indicators can be suggested. These are *pressure indicators, impact indicators and sustainable indicators*.

- Sustainable development creates consciousness about environment among the present generations so that the same (greater, if possible) natural resources can be left for the future generations. It improves quality of life of human and other living beings within the limited capacity of the environment. It tries to maintain the balance among economic, social and environmental problems so that better lives can be provided for all kinds of living beings in the world. It encourages inventing and using better technology so that output can be produced and consumed by using least natural resources. Sustainable development encourages both producers and consumers to release residuals as least as possible. It is a multidisciplinary concept, as it provides multidimensional benefits. It tries to make understand the basic features of natural capital-uniqueness, uncertainty and irreversibility. Sustainable development holds that certain elements of nature are very critical due to their unique contribution to the living beings.
- Setting up of tide rules and regulations regarding establishment of industries and implementation of those are regarded as policy for sustainable development. Besides, reducing poverty, economic incentives for industries that use eco-friendly technology, greater participation in protection of environmental efforts, providing proper environmental education in schools and colleges are regarded some of the basic policies for sustainable development.
- Green economy, Green growth and low-carbon development are some of the related concepts of sustainable development.



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- Important websites: https://sustainabledevelopment.un.org/ https://www.undp.org/

9.10 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: The name of the organization that brought into common use of the terminology sustainable development is *World Commission on Environment and Development.*

Ans to Q No 2: The three basic ideas that definition of sustainable development covers are: (i) development, (ii) needs, and (iii) future generation.

Ans to Q No 3: The difference between growth and development is that growth is an expression for quantitative expansion of economic system. Development on the other hand, is a qualitative concept incorporating notions of improvement are progress and including cultural, social and economic dimensions.

Ans to Q No 4: The three basic components of sustainable development are (i) economic components, (ii) social component, and (iii) ecosystem component.

Ans to Q N 5: Indicator means the variables that use to measure knowledge which support for policy analysis and decision-making process.

Ans to Q N 6: Defining development indicator is quite complicated, because defining development indicator is too normative. No single indicator can give a perfect and complete picture about the state of welfare. Regarding social issues, it is very difficult to measure social dimensions. Justice and equity are not easy to define. Likewise, the environmental dimensions invite several new indicators for discussion. Only a few of ecological attributes are quantifiable. Ecological status of aesthetic beauty is not easy to put on any scale or indicator, though some of the environment related factors could be viewed in terms of selected physical indicators. For example, air pollution can be viewed in terms of emission of CO_2, SO_2 or NO_x.

Ans to Q No 7: In order to capture all aspect of ecological and environmental changes, the three types of indicators of sustainable development are (a) pressure indicator, (b) impact indicator, and (c) sustainable development indicator.

Ans to Q No 8: Sustainable development try to create consciousness about environment among the present generations so that the same (greater, if possible) resource can be left for the future generations for their better life.

Ans to Q No 9: Sustainable development encourages producers to invent and use better technology so that output can be produced by using least natural resources.

Ans to Q No 10: The three basic features of natural capitals are, (a) uniqueness, (b) uncertainty, and (c) irreversibility.

Ans to Q No 11: Tide rules and regulations should be set regarding establishment of industries, because industrial pollutions are regarded as one of the major sources of environmental pollution.

Ans to Q No 12: The two examples of economic incentive which use eco-friendly technology are (a) imposing low tax rate, (b) providing subsidy.

Ans to Q No 13: The three concepts that related to sustainable development are (b) green economy, (b) green growth, and (c) low-carbon development.

Ans to Q No 14: The concept of low-carbon development was adopted by United Nations Framework Convention on Climate Change (UNFCCC) in 1992.



9.11 MODEL QUESTIONS

Short questions (Answer each question in about 150 words)

Q.1: Discuss the concept sustainable development?

Q.2: Discuss the different indicators of sustainable development?

Q.3: Discuss the significance and importance of sustainable development?

Q.4: What are the different policies, which should be adopted for sustainable development?

Q.5: Discuss the different concepts related to sustainable development?

Long questions (Answer each question in about 500 words)

Q.1: Critically discuss the different measures of sustainability.

Q.2: Discuss the problems related to implementation of policies regarding sustainable development.

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UNIT 10: ENVIRONMENTAL ACCOUNTING

UNIT STRUCTURE

10.1 Learning Objectives

10.2 Introduction

10.3 Environmental Accounting

10.4 Environmental Auditing

10.5 Environmental Impact Assessment (EIA)

10.6 Let Us Sum UP

10.7 Further Reading

10.8 Answer to Check Your Progress

10.9 Model Questions

10.1 LEARNING OBJECTIVES

After going through this unit, you will be able to know -

- the objectives of environmental accounting.
- meaning and objectives of environmental auditing,
- definition and significances of environmental impact assessment, and
- process of environmental impact assessment.

10.2 INTRODUCTION

Natural resources provide energy and materials that are used to produce goods and services to satisfy human needs. Overuse of natural resources create two basic environmental problems simultaneously viz. scarcity of natural resources and huge release of residuals which increase the carrying capacity of the earth. Because of these two basic environmental problems, the concept of environmental accounting, auditing and environmental impact assessment is becoming popular throughout the world. It is made compulsory to do environmental accounting, auditing and environmental impact assessment in most of the countries.

10.3 ENVIRONMENTAL ACCOUNTING

There is no standard definition of environmental accounting. In general, it is a term used to take into account the environment and changes in it, and integrating the results with the systems of national accounts (SNA) so as to provide a valuable information base for planning and making policies for the integrated sustainable development and growth of the nation as a whole. It is also known as natural resource accounting. Environmental accounting is an approach to accounting that includes measures of the environmental impacts and resource use of economic activities as well as financial measures. It is the publication of information about the level of natural resource use, existing stocks of natural resources and environmental degradation, within a country or a region. Environmental accounting is also called Green *Accounting* which refers to modification of the system of national *accounts* to incorporate the use or depletion of natural resources. *Environmental accounting* is a vital means to assist in the management of *environmental* and operational costs of natural resources. It is the estimation and public reporting of environmental liabilities and environmental costs.

There are some basic objectives of environmental accounting which can be represented as follows:

- Taking the total stock of assets or reserves related to environmental issue and changes therein.
- Estimation of the total expenditure related to protection or enhancement of environment.
- To identify that part of the gross domestic product which reflects the cost necessary to compensate for the negative impact of economic growth i.e. the so-called defensive expenditure to protect environment.
- Assessment of environmental costs and benefits, which includes-
    (a) The decrease or depletion in natural resources due to their use in production and final demand, and

(b) The changes in environmental quality resulting from pollution and other impacts of production and consumption and other natural events on one hand, and the expenditure for environmental protection and enhancement of the environment on the other.

- Elaboration and measurement of indicators, relating to environmentally adjusted product and income which are disclosed by Environmentally Adjusted Net Domestic Product (EDP), i.e., Net Domestic Product minus Environmental costs.
- Analysis of EDP, it is to plan the use of resources by squeezing them and reducing waste to attain sustainable development.

A number of countries have carried out the exercise of environmental accounting so far. However, the methodologies adopted by the countries are not same. In India, there is no common method of environmental accounting adopted by corporate or government. In the international level, since the 1970s, the work on the designing of environmental accounts has been going on. In the 1980s, the United Nations Environmental Programme (UNEP), the United Nations Statistical Division (UNSTAT) and the World Bank launched concerned international efforts to build consensus on how the System of National Accounts (SNA) might be modified to include environmental problem. As a consequence, a draft titled 'Handbook for integrated Economic and Environmental Accounting' was published in 1993, encompassing the preliminary methodology to be tested and refined. The approach in this document is often referred to as a system of Integrated Economic and Environment Accounting (SEEA). The SEEA tries to integrate the various methods available for environmental accounting into a single framework. This document offers a series of versions or 'building blocks' for the construction of accounts beginning with physical accounts and disaggregation of data already included in SNA. It also works towards more complex information such as calculation of depletion and estimation of maintenance costs required for sustainable use of resources. None of the versions of SEEA encompasses the valuation of non-marketed environmental services. UNSTAT, with UNEP and other experts, is preparing

a practical manual or Work Book for implementing SEEA. The SEEA is a proposed methodology and does not have official approval of the United Nations.

10.4 ENVIRONMENTAL AUDITING

Auditing is an inspection or systematic examination of a process or activity, often carried out by an independent or external specialist, designed to ensure compliance with requirements. Environmental auditing is a formal independent evaluation of compliance with environmental regulations, standards and policies or an assessment of the management of any impact on the environment. For example, pollution prevention initiatives require an audit to determine where wastes may be reduced or where energy can be conserved. Like general auditing, environmental auditing is also done by independent body or recognized company or agency. Environmental audit determines how well the businessmen comply with environmental laws and regulations. An audit may relate to a strict compliance audit, where facility activities are reviewed against legislative requirements or as part of a company's/firm's management system to ensure environmental best practice. Environmental audits cover a wide range of environmental issues and also focuses on a particular aspect such as air and water permit etc.

Environmental audits are generally performed on a routine or periodic basis. Frequent environmental auditing is appropriated, because, if it is done frequently then the central or state or local government can issue notice more frequently to firms/companies regarding violation of norms.

The objectives of environmental auditing cover three major issues, viz,

- *The financial issue*, the objectives of environmental auditing include- (a) to help in avoiding fines by regulatory agencies, (b) to identify issues of non-compliance sooner versus later allowing for proactive financial planning, and (c) to lower corrective action costs, and to minimize opportunities leading to reduce operating costs.

- *The issue of compliance*, the objectives of environmental auditing include, (a) to reduce agency enforcement actions and penalties, and (b) to increase awareness among the employees regarding environmental standards and responsibilities.
- *The issue of stakeholder relations*, the objectives of environmental auditing include- (a) to improve employees' relations with the employers and increase ethical thoughts on environment, and (b) to improve community image goodwill of the respective company/ firm that they are concerned about sound environmental programmes.



CHECK YOUR PROGRESS

Q 1: What do natural resources provide to producers to produce goods and services?

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Q 2: Define environmental accounting.

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Q 3: What are the two issues related to assessment of environmental cost and benefits?

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Q 4: What is environmental auditing?

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Q 5: Why frequent environmental auditing is appreciated?

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10.5 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Environmental Impact Assessment (EIA) refers to the evaluation of the effects of a proposed major project on a man-made environment. It is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, basically, the adverse impacts. It is the basic tool for the sound assessment of development proposals.

10.5.1: Significances of EIA

Why do we need EIA? We need EIA, because the EIA helps the decision makers to identify the possible effects at an early stage and to improve the quality of proposed projects. It is a process used to predict the environmental consequences of proposed major development projects, to identify and plan for appropriate measures to reduce the possible adverse impacts. The significances of the EIA can be cited as follows-

- An EIA is a means to a larger end, the protection and improvement of environmental quality.
- It is not just a single technique or method but a procedure that uses many approaches to evaluate environmental impacts.
- It is interdisciplinary, since the impacts of proposed developmental projects are multidimensional.
- In is an integral part of project planning and not just an addition.
- An EIA does not make decision but its findings should be considered in policy and decision making.

10.5.2: Process of the EIA

An EIA attempts to answer the following questions:

- What will happen as a result of the proposed project?
- What will be the extent of the changes, because of the proposed project?
- Do the changes matter?
- What can be done about them?

- How can decision makers be informed of what needs to be done?

Answers to these five questions are given through five steps.

- Identification of impacts.
- Predictions of significance of causes and effects of impacts.
- Evaluation of the predicted adverse impacts to determine whether they are significant enough of warrant mitigation.
- Suggesting a wide range of measures to prevent reduce or remedy those adverse impacts which warrant mitigation.
- Documentation of the process and conclusion.

However, the EIA does not require in all proposed developmental projects. There are three options available before a proposed developmental project, viz. No EIA required, uncertainty and EIA required. When EIA does not require, the available options are: either reject the proposed developmental projects or approved it. In case of uncertainty, a preliminary assessment is done to assist project planning. Preliminary assessment identifies the impact and predicts the magnitude of impacts and evaluates their importance to decision makers and helps to clear the projects of a full EIA. If preliminary assessment calls for full EIA, then only the process of the EIA has been done.

Once the proposed project is recommended for EIA, the first step is *Identification* of the impacts from that proposed project. The identification of the impacts depends on the magnitude of the project, geographical extent, significance of decision makers etc. Once the most important impacts are identified, the second step is *Prediction* of the impacts, which includes quantification of impacts through mathematical models, physical models, socio-cultural models, economic models and experiments. The third step that seeks to answer the question 'do the changes matter?' *evaluates* the predicted adverse impacts by comparing it with laws, regulations, or accepted standards or by reference to pre-set criteria, or on the basis of acceptance to local community or public in general. In fact, evaluation involves consultations with relevant decision makers. The fourth

step is ***Mitigation Measures***. If evaluation warrants mitigation for the impacts, it may suggest some mitigation steps to follow, say, (i) change the project site, (ii) change the production process, (iii) change the raw materials, (iv) introduction of pollution control methods, say, wastes treatment, monitoring pollution etc. (v) restoration of damaged resources, compensation to affected community, or persons etc. Then only the fifth step i.e. ***documentation*** is done. After documentation, a draft EIA report is prepared. The report is reviewed by experts. The final EIA report is placed after correction is done. There are two options available once the final EIA report is placed, viz. rejection and approval. The proposed developmental project is implemented, once it is approved.

10.5.3: EIA in India

When the Department of Science and Technology took up environmental appraisal of river valley projects, EIAs of development projects were first started in 1977-78 in India. Afterward, various other projects were brought under the purview of EIA. However, the EIA was made mandatory in India in 1994, under the Environmental (Protection) Act of 1986. The Ministry of Environment and Forests (MoEF), Government of India has prepared environmental guidelines, to help the project proponents to work out an EIA. Guidelines have been prepared to bring out specific information on the environment required for environmental approval. The agencies which are primarily responsible for the respective sectors are closely involved in preparing the guidelines. Basically, river valley projects, thermal power projects, mining projects and industries, ports and harbours, development of beaches, highway/railway projects are the sectors for which guidelines have already been prepared. These guidelines basically consist of aspects regarding planning and implementation of development projects. As of now, in India, EIA is required for 30 categories of industrial projects.



CHECK YOUR PROGRESS

Q 6: What is Environmental Impact Assessment (EIA)?

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Q 7: Why does Environmental Impact Assessment require?

Answer: _

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Q 8: What are the possible options after preliminary evaluation has been done for a proposed project?

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Q 9: According to which act Environmental Impact Assessment is compulsory in India?

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10.6 LET US SUM UP

- In general, Enviromental Accounting is a term used to take into account the environment and changes in it, and integrating the results with the systems of national accounts (SNA) so as to provide a valuable information base for planning and making policies for the integrated sustainable development and growth of the nation as a whole. It is the publication of information about the level of natural resource use, existing stocks of natural resources and environmental degradation, within a country or region.
- There are numbers of objectives of environmental accounting. Some of them are: - eestimation of the total expenditure protection or enhancement of environment, to identify that part of the gross domestic product which reflects the cost necessary to compensate

for the negative impact of economic growth i.e. the so-called defensive expenditure to protect environment, assessment of environmental costs and benefits etc.

- A number of countries have carried out the exercise of environmental accounting so far. In India, there is no common style of environmental accounting has been developed. In the international level, since the 1970s, the work on the design of environmental accounts has been underway.
- Environmental auditing is a formal independent evaluation of compliance with environmental regulations, standards and policies or an assessment of the management of any impact on the environment. Environmental audits are generally performed on a routine or periodic basis. Objectives of environmental auditing include three basic issues, viz. financial, compliance and stakeholder relation.
- Environmental Impact Assessment (EIA) refers to the evaluation of the effects of a major project on a man-made natural environment. It is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, basically, adverse impacts.
- The EIA is necessary, because the EIA helps the decision makers to identify the likely effects at an early stage and to improve the quality of project planning and decision making. It is a process used to predict the environmental consequences of proposed major developmental projects, to identify and plan for appropriate measures to reduce adverse impacts.
- The EIA does not require in all developmental projects. There are three options available before a proposed developmental project, viz. No EIA required, Uncertainty and EIA required. In case of uncertainty, a preliminary assessment is done to assist project planning. Preliminary assessment identifies the impact and predicts the magnitude of impacts and evaluates their importance to decision

makers and helps to clear the projects of a full EIA. If preliminary assessment calls for full EIA, then only the process of the EIA has been done.

- When the Department of Science and Technology took up environmental appraisal of river valley projects, EIAs of development projects were first started in 1977-78 in India. Afterward, various other projects were brought under the purview of EIA. However, the EIA was made mandatory in India in 1994, under the Environmental (Protection) Act of 1986.



10.7 FURTHER READING

- Bhattacharya, R. N. (2001). *Environmental Economics: An Indian Perspective*, (edited book), Oxford University Press.
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- Ulaganathan, S. (2001). *Environmental Economics, Readers in Economics*, Oxford University Press.



10.8 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: Natural resources provide energy and materials to producers to produce goods and services.

Ans to Q No 2: Environmental accounting is an approach to accounting that includes measures of the environmental impacts and resource use of economic activities as well as financial measures.

Ans to Q No 3: The two issues related to assessment of environmental costs and benefits are- (a) the decrease or depletion in natural resources due to their use in production and final demand, and (b) the changes in environmental quality resulting from pollution and other impacts of production and consumption and other natural events on one hand, and the expenditure for environmental protection and enhancement of the environment on the other.

Answer to Q.4: Environmental auditing is a formal independent evaluation of compliance with environmental regulations, standards and policies or an assessment of the management of any impact on the environment.

Answer to Q.5: Frequent environmental auditing is appropriated, because, if is done frequently then, the central or state or local government can issue notice more frequently regarding violation of norms.

Answer to Q.6: Environmental Impact Assessment (EIA) refers to the evaluation of the effects of a major project on a man-made natural environment. It is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, basically, adverse impacts.

Answer to Q.7: The EIA requires, because the EIA helps the decision makers to identify the likely effects at an early stage and to improve the quality of project planning and decision making. It is a process used to predict the environmental consequences of proposed major development projects, to identify and plan for appropriate measures to reduce adverse impacts.

Answer to Q.8: The possible options after preliminary evaluation has been done for a proposed project is (a) rejection of the proposed project, (b) approval the proposed project, and (c) EIA requirement of the proposed project.

Answer to Q.9: In India, EIA is statutory according to the Environmental (Protection) Act, 1986.



10.9 MODEL QUESTIONS

Short questions (Answer each question in about 150 words)

Q 1: What are the objectives of environmental accounting?

Q 2: Discuss the objectives of environmental auditing.

Q 3: Discuss the significances of Environmental Impact Assessment.

Long questions (Answer each question in about 500 words)

Q 1: Give an account of Environmental Accounting in international level.

Q 2: Discuss the processes of Environmental Impact Assessment.

Q 3: Give an account of Environmental Impact Assessment adopted in India.

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UNIT 11 : INSTRUMENTS OF ENVIRONMENTAL PROTECTION-I

UNIT STRUCTURE

11.1 Learning Objectives

11.2 Introduction

11.3 Types of Instruments

11.4 Conventional Instruments –Command and Control Measures

11.5 Importance of Conventional Instruments

11.6 Let Us Sum Up

11.7 Further Reading

11.8 Questions to Check Your Progress (Very Short Questions)

11.9 Answers to Check Your Progress

11.10 Model Question

11.1 LEARNING OBJECTIVES

After going through this unit, you will be able to

- understand about the emergence and need of environmental protection measures
- discuss the role of various types of environmental protection measures
- explain about different types and need of Command and Control (CAC) measures
- interpret the implications of CAC measures

11.2 INTRODUCTION

The practice of protecting the natural surroundings or environment by individuals, society, institutions, organizations and governments is defined as Environmental protection. The prime objective of environmental protection policies is to conserve natural resources along with the existing natural environment. The secondary objective is, where possible, to repair damage and reverse the trend of environmental degradation. Thus we can say that

environmental policy instruments are tools used by governments to implement their environmental policies to preserve the environment as a whole. Governments may use a number of different types of instruments. For example, economic incentives and instruments which are market based such as taxes and tax exemptions, tradable permits, and fees. Market based instruments can be very effective to encourage compliance with environmental policy. Corporate companies who engage in efficient environmental management and are transparent about their environmental data are reporting benefit from improved business performance.

In most of the cases, now a day, several instruments are combined in a policy to combat the environmental problems. Since, environmental issues have many aspects; several policy instruments may be required at a time to adequately address each one. Moreover, a combination of different policies may give firms greater suppleness in policy compliance and reduce uncertainty about the cost of such compliance. Therefore, government policies must be cautiously formulated so that the individual measures do not demoralize one another. Then only it may be able to create a more flexible and cost-effective framework. Overlapping policies result in unnecessary administrative costs due to the high cost of implementation.

11.3 TYPES OF INSTRUMENTS

There are basically two major kinds of tools available for environmental policy making. On the one side the more reactive command-and-control approaches (CAC) and on the other side preventive market-based instruments creating more economic incentives not only for industries but also for private persons to reduce harm to the environment. Most of the Governments have traditionally employed CAC regulations in the 1970s and 1980s. In India also The Wild Life Protection Act, 1972, The Water (Prevention & Control of Pollution) Act 1974 and many more laws are enacted in this regard. This approach was afterwards reconsidered when economic studies become critical about CAC regulations and points out that these are often cost-ineffective, inflexible, and of limited efficacy. In particular, the

private sector lacks an incentive to invest in developing a new and better control technology or strategy when the government dictates flat CAC rules.

However in this chapter, we will look into the CAC instruments as an environment protection tool and its importance in particular.

It has been recognised that command-and-control regulations were highly successful in protecting and cleaning up the US environment back in 1980-90s and beyond that. The Environmental Protection Agency was created to oversee all environmental laws in 1970 in the United States. To address air pollution, in the same year, the Clean Air Act was enacted. Just after two years, Congress passed and the president signed the far-reaching Clean Water Act in 1972. These command-and-control environmental laws, and their amendments and updates, have been largely responsible for cleaner air and water in the United States in recent decades.

Table 1.1 depicts a general taxonomy of climate policy instruments. This section will give a short introduction to each instrument category.

Environmental policy instruments are basically divided into market-based and non-market-based instruments. Although some environmental economists also talk about some other fixed solutions like Coase theorem, Kaldor – Hicks compensation criteria etc. as some other possible types of solution, we will strictly look at the market based and CAC measures only.

Table 11.1 Types of Environmental Protection Policies

Market Based Instruments	**Command and Control Instruments**
Emission fees	Emission standard
Marketable pollution permits	Technology standard
Environmental taxes	

Source: With the help of Blackman & Harrington, 1999

Another classification of all the policy instruments with their strength and limitations can be as follows.

Table 11.2: Taxonomy of Climate Policy Instruments

Instruments	What is meant	Example	Strength	Weakness
Prescriptive Regulations (CAC)	The government tells about what to do	Endangered Species Act, Clean Water Act, Clean Air Act	Simple to administrate, predictable results	No incentives , lots of loopholes, inflexible
Property Rights	The government distributes the rights	Fishing rights	Allow markets to work, more flexible	Can be expensive, setting up is difficult
Penalties/tax	The Government taxes 'bad' behaviour	Carbon tax, gas and heavy taxes	Economically efficient, allows markets to work	Taxes are not always preferred
Payments	The government subsidizes 'good' behaviour	Grazing on national land	popular	Someone has to pay for it
Persuasion	The government tries to persuade people	Information on the product like cigarette and its health hazards, product labelling	No coercion	Effects can be small
Provision	The government does it	National Parks, Wild life refuges	Easy to set up and no coercion	Can be expensive, not suitable for all projects

Source: Prepared with the help of Leslie Ruyle, 2018[1]

Command-and-Control regulation sets precise limits for pollution, emissions and/or requires that specific pollution-control technologies that must be used.

Property rights can be also another handy tool to solve some problems. The innovative extension of property rights to ecological resources could help address many environmental problems. Predominantly in the case of natural resources, property rights are a feasible and demonstrated means of attractive sustainability, particularly when compared to the available political alternatives. Property rights are basically subjective rights. Normally, they belong to somebody. Either a person or legal corporation or government

[1] (https://youtu.de/LTyYlt12IY8)

is responsible for the act. Accordingly, they can be the subject of contracts to civil war.[2]

Market-based instruments are indirect regulatory instruments. These instruments influence peoples' behaviour by changing their economic incentive structure. Although, costs from environmental externalities, for example greenhouse gas (GHG) emissions, are usually not visible in consumption or investment decisions but are nonetheless imposed on third parties. Therefore, market based instruments work by reflecting the environmental impact of a certain action by attaching a cost to it. It is a kind of signal that provides an incentive to the polluter to reduce this impact. The idea of environmental taxation was first introduced by Arthur Cecil Pigou; therefore, these taxes are sometimes also referred to as Pigouvian taxes. Environmental taxes adjoin directly to the price of a certain good or service; therefore, they ideally should reflect the environmental externalities caused by production and/or consumption of this good or service. The rise in costs is usually passed through to the end consumer. In theory, the consumer reacts with a reduction of demand, as the price increases. However, consumer reactions are hard to predict and depend on availability of substitutes and perceptibility of the price signal. This type of tax fixes a price and thereby indirectly influences behaviour. It is also crucial to set the price at the right level. For these reasons environmental taxes bear a certain degree of uncertainty regarding their environmental effectiveness.

Persuasion aims to give consumers access to information on the environmental performance of the product. By the way of environmental product labelling it distributes information to consumers to put them into position to include environmental characteristics in their consumption decisions. The labels can contain information on product content, composition, and its origin or production method[3]. In climate policies the energy performance of products plays an important role. Energy efficiency labels can also provide incentives for industries to develop energy efficient products. It can work as a means of marketing products to

[2] linkspringer.com/chapter/10.1007/

[3] Michael Common & Sigrid Stagl, "Ecological Economics", Cambridge University Press,2012

consumers as superior to others (based on a more favourable label). However, a precondition is that labels are updated regularly so that to keep up with efficiency advances and also to incentivise them. The energy consumption labelling scheme introduced by the Directive on Energy Labels informs consumers on the energy performance of most household appliances, of light bulbs and also cars. Thus, the products' energy efficiency is rated in terms of a set of energy efficiency classes[4].

Provision can be another option if government is in a position to provide them in the form of giving protection. For example, wild life sanctuaries, national parks are good example of protecting the flora and fauna of the region.



CHECK YOUR PROGRESS

Q 1: The practice of protecting the natural surroundings/environment by individuals, society, institutions, organizations and governments is defined as.....

Q 2: Market-based instruments are..... regulatory instruments.

Q 3: Property rights are basically .....rights.

Q 4: The labels can contain information on....., composition, and its origin or production method.

Q 5: .....instruments have a number of political features that encourage their adoption.

11.4 CONVENTIONAL INSTRUMENTS: COMMAND AND CONTROL MEASURES

Command-and-control instruments inflict direct regulatory intervention by means of setting standards, e.g. of pollution output or technology requirements. In climate change policies, these are mainly connected to greenhouse gas (GHG) emissions or energy efficiency. In the case of nonconformity of standards are usually combined with legal

[4] http://climatepolicyinfohub.eu/glossary/4# energy efficiency

enforcement. They are a very straight-forward way of policy intervention with relative certainty over the environmental effectiveness (Stagl, 2012). Forms of command-and-control instruments mainly comprise framework, performance and technology standards, as well as prohibition of certain products and practices. Command-and-control (CAC) approaches indicate regulatory instruments that speak about abatement decisions. CAC measures fall in two broad categories: i) technology standards, which impose on emitters the use of specific abatement technologies; and, ii) performance standards, which set specific environmental targets to be met (e.g. a certain amount of emissions per unit of output) without mandating particular technologies. By forcing all firms to undertake specific emission reduction efforts regardless of their individual abatement costs, CAC instruments do not, in general, achieve marginal abatement cost equalisation and, thus, do not minimise overall abatement costs (Russell, 1985). Again, technology standards are usually more costly than performance standards. But the latter give firms greater flexibility in selecting the abatement option that is most adapted to their individual situation. For a CAC instrument to be as cost-effective as a market-based incentive, firms' marginal abatement costs should be similar, or the supervisory body should have full information about individual cost structures and then set regulation accordingly. These conditions are improbable to be met in practice. Also, principles can be subject to "regulatory capture" by lobbies that gradually undermines economic efficiency. Finally, unlike price-based instruments, standards do not yield any "double dividend" since they do not raise fiscal revenues. However, if cautiously designed, CAC instruments can add to deal with a number of market imperfections that are left unaddressed by market-based incentives: In number of conditions like when emissions cannot be perfectly observed. For example, fugitive emissions from pipelines, methane from agriculture etc can be monitored by effective CAC tools. Market-based incentives are unable to minimise abatement costs as they do not address the monitoring issue. In principle, cost-effectiveness can then be enhanced through the use of technology standards. Another fact is that performance standards are useless in this context since their implementation also requires

adequate emissions monitoring. When the emissions observation imperfection is large and abatement costs are relatively homogenous across agents, such standards have been shown to be more cost-effective than market-based incentives (Montero, 2005). Their performance can be further enhanced by combining them with market incentives whose effects can be measured, when these are available. In situations where asymmetric information between two contracting parties with opposite goals creates adverse selection and/or moral hazard problems, well-designed CAC instruments may also perform better than market incentives. Examples of such market failures have been identified especially in energy service markets (Sorrell et al. 2007). For example, in the housing market, landlords have better information than tenants but have little motivation to install the most energy-efficient equipments because they do not pay the energy bill. Similarly, asymmetric information between buyers and sellers may also prevent house prices from fully reflecting the discounted value of efficiency investments. The invisibility of energy-efficiency performance of electrical appliances and light bulbs may also prevent households from optimising energy consumption. In such cases, policy should as much as possible address directly the market failure involved through information instruments, such as public disclosure requirements or eco-labelling. However, when information instruments are costly or insufficient, standards can be justified, and they have been found to yield sizeable welfare gains. It has also been argued that CAC instruments should be preferred to market-based incentives in situations where agents do not respond to price signals. For instance, lack of institutional – including monitoring – capability may impede the proper functioning of market-based incentives in lower-income countries, while technology standards may be comparatively easier to implement and track. Standards may help raise emissions abatement in state enterprises with market power closer to levels that would be undertaken if such firms operated under private governance in competitive markets.

11.5 IMPORTANCE OF CONVENTIONAL INSTRUMENTS- COMMAND AND CONTROL

The hypothetical case for CAC instruments should, on the other hand, be qualified on three grounds:

1. Policymakers should make sure that the use of standards addresses genuine market failures, rather than merely high transaction costs. Hidden transaction costs may explain why apparently efficient investment decisions – e.g. in energy efficient equipments – are rationally not taken up by optimising households and firms. For example, transaction costs, rather than market imperfections, may partly explain why landlords and tenants do not in practice sign the type of shared-savings contracts that would seem to benefit both parties a priori.
2. CAC instruments have a number of political features that encourage their adoption. They already represent the most common form of environmental regulation. CACs can be easily enforced through existing national institutions, and unlike price instruments their costs are not immediately visible to voters. Some economists have also argued that international negotiations to set technology standards for key emitting industries could succeed in bringing large emitters from developing countries on board, if accompanied by technology transfers. Nevertheless CAC instruments offer little scope for addressing the “free-rider” problem affecting international climate policy negotiations. As a result, if large reductions in worldwide GHGs were to be secured through standards, adoption incentives could be weak.
3. Unlike with permits, burden-sharing rules cannot be built in CAC instruments and would, therefore, have to be negotiated separately. Information problems would affect such negotiations, reflecting the difficulty to assess the costs of implementing standards.

Finally, going through the existing literature it can be said that the idea of getting same international standards is unclear and whether it would

actually be desirable. Another important point is that while expanding the international coverage of price instruments at all times reduces the overall cost of achieving a given worldwide reduction in GHG emissions, mandating uniform standards across all countries may not.

However, economists have pointed out four difficulties with command-and-control environmental regulation.

First, command-and-control regulation offers no inducement to improve the quality of the environment beyond the standard set by a particular law. Once the command-and-control regulation has been satisfied, polluters have zero incentive to do better.

Second, command-and-control regulation is stiff or not flexible. It typically requires the same standard for all polluters, and often the same pollution-control technology as well. This means that command-and-control regulation do not recognise the distinctions between firms that would find it easy and inexpensive to meet the pollution standard or/and to reduce pollution even further; and firms that might find it difficult and costly to meet the standard. Generally, firms have no reason to rethink their production methods in fundamental ways that might reduce pollution even more and at lower cost.

Third, command-and-control regulations are written by legislators and the Environmental Protection Agency. Therefore, they are subject to compromises in the political process. Existing firms often argue and lobby so that stricter environmental standards should not be applied on them. They insist on the fact that the rules should fall upon new firms that wish to start production. Consequently, real-world environmental laws are full of fine print, loopholes, and exceptions.

Fourth, CAC are rarely effective in comparison to other instruments like tax and permits. Again, government may not have enough information to order the least cost method.

Critics of command-and-control regulation appreciate the goal of reducing pollution, but they question whether this type of regulation is the finest way to design policy tools for accomplishing that goal. But in most of the developing countries, CAC measures are great in use in combinations of other available instruments.



CHECK YOUR PROGRESS

Q 6:State true or false

a) Market-based incentives are unable to minimise abatement costs as they do not address the monitoring issue. (true/false)

b) Command-and-control regulation is flexible. (true/false)

c) Forms of command-and-control instruments mainly comprise framework, performance and technology standards, as well as prohibition of certain products and practices. (true/false)

d) Provision aims to give consumers access to information on the environmental performance of the product. (true/false)

e) CAC instruments should be preferred to market-based incentives in situations where agents respond to price signals. (true/false)



11.6 LET US SUM UP

- Environmental protection is the practice of protecting the natural surroundings/environment by individuals, society, institutions, organizations and governments.
- There are two types of environmental protection policies basically-market based and non-market based instruments.
- Market-based instruments are indirect regulatory instruments.
- Command-and-control instruments inflict direct regulatory intervention by means of setting standards, e.g. of pollution output or technology requirements.
- CAC instruments can add to deal with a number of market imperfections that are left unaddressed by market-based incentives.
- CAC can be the best possible solution when the problem is well known and success requires very strong compliance.
- CAC instruments should be preferred to market-based incentives in situations where agents do not respond to price signals.



11.7 FURTHER READING

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11.8 ANSWERS TO CHECK YOUR PROGRESS

A. a) Environmental protection b) indirect c) subjective d) product content e) CAC

B.
a) Market-based incentives are unable to minimise abatement costs as they do not address the monitoring issue. (True)
b) Command-and-control regulation is flexible. (False)
c) Forms of command-and-control instruments mainly comprise framework, performance and technology standards, as well as prohibition of certain products and practices. (True)
d) Provision aims to give consumers access to information on the environmental performance of the product. (False)
e) CAC instruments should be preferred to market-based incentives in situations where agents respond to price signals. (False)



11.9 MODEL QUESTIONS

Short Questions (Answer each question in about 150 words)

Q 1: How command and Control measures of environmental regulation help in protection of environment.

Q 2: What are the markets based instruments of regulation of environment?

Long Questions (Answer each question in about 300-500 words)

Q 1: What are the types of environmental protection instruments? State in brief (within 500 hundred words)

Q 2: Discuss the advantages and disadvantages of command and control measures. (Within 650 words)

Q 3: Write a short note for each of the following (each within 150 words)

a) Property right b) Penalty c) Persuasion

*** ***** ***

UNIT 12: INSTRUMENTS OF ENVIRONMENTAL PROTECTION- II ECONOMIC INCENTIVE MEASURES

UNIT STRUCTURE

12.1 Learning Objectives

12.2 Introduction

12.3 Pollution Fees/Tax

12.4 Tradable Pollution Permit

12.5 Liability Rules

- 12.5.1 Non-Compliance Fees
- 12.5.2 Deposit Refund System
- 12.5.3 Performance Bonds

12.6 Let us Sum up

12.7 Further Reading

12.8 Answers to Check Your Progress

12.9 Model Questions

12.1 LEARNING OBJECTIVES

After going through this unit, you will be able to

- describe pollution tax method of pollution control
- explain about tradable pollution permit method
- discuss different liability rules such as deposit refund system, non-compliance fees and performance bonds

12.2 INTRODUCTION

Government policies to control pollution can be broadly classified into two categories, that is, command and control policies and economic incentives. As the name indicates, command and control policies are implemented by orders of the regulator (i.e. government). Under command and control policies, the polluter has no option to choose any particular method to control pollution. However, under economic incentive method

(which are non-conventional in nature), the profit or cost of production is linked to the level of pollution caused by a particular producer. This system raises the cost of environmental degradation, while allowing the producer the flexibility to find the least cost pollution control method. Under this method, there is an incentive to reduce pollution, as lower level of pollution reduces cost of production or increases profit. This is why economic incentives are also known as incentive based measures. The economic incentive measures are of three types:

(a) Pollution Tax (or subsidy)

(b) Tradable Pollution Permits and

(c) Liability Rules.

12.3 POLLUTION TAX/ FEES

One of the criteria of pollution control policy is efficiency. Efficiency of a policy indicates that targeted reduction in pollution is to be achieved through minimum cost. Empirical studies state that "pollution tax" or "polluter pays" is the most efficient method of pollution control. The pollution tax method may take different forms such as taxes on polluting inputs, taxes on emissions, product tax and subsidies on pollution reduction.

Externality exists when one economic agent's (consumer or producer) action (consumption or production) affects another agent's welfare directly rather than through market price or quantity. In other words, one person's consumption (or one firm's production) imposes cost or benefits on another consumer or producer. Externality may be positive (benefit) or negative (cost). Pollution is nothing but negative externality, as pollution generated by an industry (producer) or a smoker (consumer) affects the welfare of all other individuals in the society. Under pollution tax (fees) method, the polluter has to pay the cost made by his action (pollution).

An individual economic agent is in equilibrium; when

Marginal Private Cost = Marginal Private Benefit

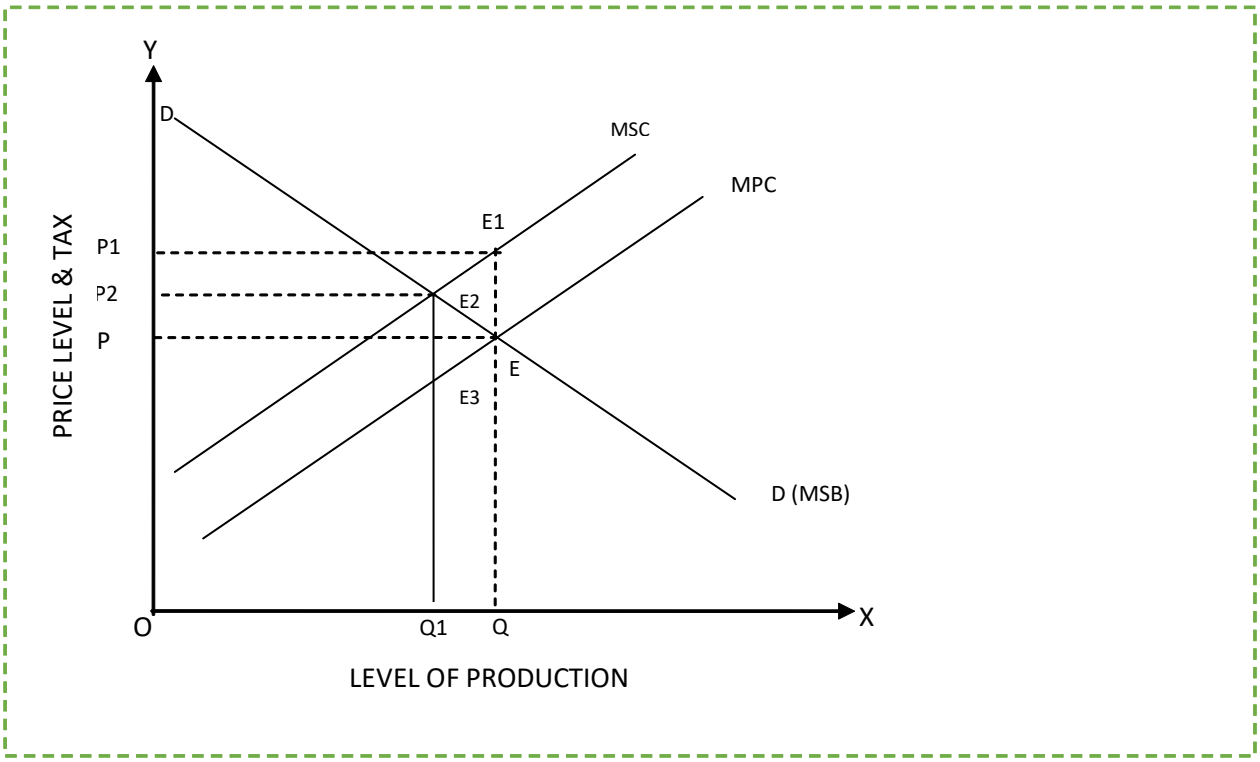
However, the society's welfare is maximised or the society is in equilibrium, when

Marginal Social Cost = Marginal Social Benefit

Or, Marginal Private Cost + Marginal External Cost = Marginal Private Benefit + Marginal External Benefit

The system of pollution tax to reduce pollution can be explained with the help of Fig. 12.1

Fig. 12.1: Pollution Tax to Control Pollution



In Fig. 12.1, the downward sloping demand curve (D) indicates the marginal social benefit (MSB). MPC and MSC indicate the marginal private cost of an individual polluter and marginal social cost respectively. The difference between MPC and MSC is the marginal external cost. In other words, marginal external cost (negative externality) is not a part of the private cost of the producer, but it costs to the society. Without any intervention from the regulator (or government), the equilibrium level of price and output are OP and OQ respectively, corresponding to the point of interaction between D and MPC. However, due to the existence of marginal external cost (negative externality), OQ level of output is not socially desirable. So

the regulator has decided to impose tax equal to EE1 per unit of output. After imposition of tax, the marginal private cost (MPC) becomes equal to marginal social cost (MSC) and the market is in equilibrium at point E2. Accordingly, equilibrium level of price and output are OP2 and OQ1 respectively. Thus, pollution tax controls pollution through higher price level and reduction in equilibrium output. It also generates revenue for the government, which can be used for cleaning up the environment.

Notably, the extent of pollution tax may be less than equal to EE1. In other words, pollution tax may cover negative externality partly or fully. If the rate of pollution tax is equal to the marginal external cost (negative externality), it is called Pigouvian tax. In case of pigouvian tax, total amount of tax revenue is equal to the volume of negative externality.

On the other hand, if the production of a commodity generates positive externality, socially desirable level of output is higher than which is produced by the market. In this case, the government may provide subsidy to the producer to produce higher level of output.



CHECK YOUR PROGRESS

Q 1: What is Pigouvian Tax? (within 30 words)

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Q 2: Define externality. (within 40 words)

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Q 3: What is the difference between marginal private cost and marginal social cost? (within 10 words)

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12.4 TRADABLE POLLUTION PERMIT

The concept of tradable pollution permit was introduced by T. Crocker and J. Dales independently. Absence of well-defined property rights in

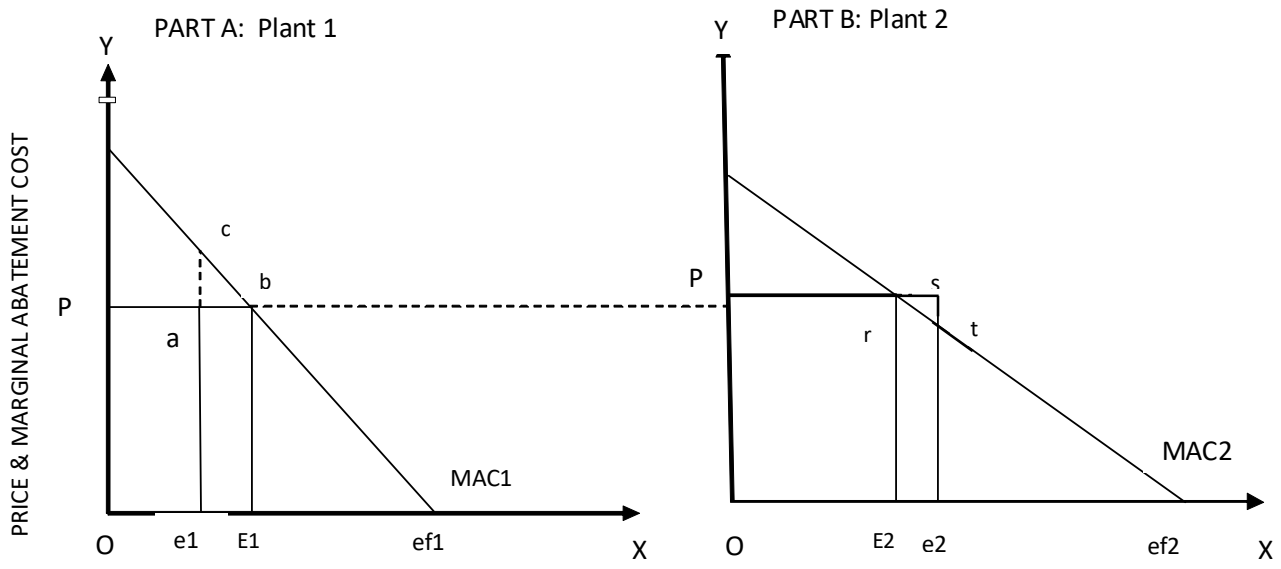
environmental resources is the main cause of environmental pollution. The main idea behind tradable pollution permit is to allocate such rights and make them marketable.

Under this system, the pollution control authority specifies the total level of emission concentration (emissions) within a particular geographical area. Thereafter, permits equal to the total permissible emissions are distributed among the potential polluters. The potential polluters are mainly the producers. The permits are tradable among the producers. Moreover, permits may also be traded among different plants of the same producer. If a producer is able to keep its pollution level below its allotted permit level, he or she can sell or lease rest of the permits to other producers.

The basic feature of tradable pollution permit is that it is beneficial for the polluters to adopt appropriate method of production to reduce pollution, if the cost of reducing the level of pollution is less than the price of the permits. Thus, the design and locations of pollution control strategies are shifted from the regulators to the potential polluters. If the potential producers are similar, the trading of permits will lead to equality in marginal abatement cost across the polluters.

The method of tradable pollution permit can be explained with the help of a simple example of two uniformly mixed pollutants. Let there be two thermal power plants in a particular location, which discharge carbon dioxide. Now, the regulator wants to fix a maximum limit on the carbon dioxide emissions in that region and has decided to give permits to the two power plants. The functioning of the system can be explained with the help of the figure 12.2.

Fig. 12.2: Allocation of Pollution, Permits and their Trading



In the figure above, level of emissions made by the plants and the number of permits allotted to them are measured on X axis. The price of permits and marginal abatement costs are measured on Y axis. In the absence of any regulation, the level of emissions made by plant1 is Oef1 and that of Plant 2 is Oef2. MAC1 represents the marginal abatement cost (MAC) of Plant 1 and MCA2 indicates that of plant 2. The price of permits supplied by the government is OP. The price of permit is determined by demand for and supply of permits. Supply of permits is fixed (E) and is determined by the regulatory authority. Demand for permits of a plant is indicated by its MAC curve. The summation of MAC of all the plants indicates market demand for permits. Thus, the price of permits OP is determined at the level, where

$$E = \sum MAC_i \text{ , where, i= 1and 2}$$

Let the regulator assign Oe1 units of permit to Plant 1 and that of Oe2 units to Plant 2. However, given OP is the unit price of the permits distributed by the regulator, the desired level of permits of Plant 1 and Plant 2 are OE1 and OE2 respectively where the price is equal to their MAC of emission control. In this situation, it is profitable for plant 2 to sale E2e2

units of permits to Plant1. Because it can reduce this much of pollution by incurring the amount of cost rE2e2t, which is less than the total cost on permit i.e. rE2e2s. In other words, Plant 2 may earn rts amount of profit, if it sells E2e2 units of permits to Plant1. Similarly, it is beneficial for Plant 1 to purchase e1E1 (or E2e2) units of permits from Plant 2. Because if Plant 1 has to reduce emission by e1E1, its MAC would be cae1E1b. However, it has to pay only ae1E1b for e1E1 units of permits. Thus, both Plant 1 and Plant 2 are benefited by trading permits.

The marketable permit system must satisfy certain criteria to work efficiently.

(a) Only a limited number of permits are to be issued and it is to be given to some definite owner.

(b) Restrictions on trading the permits should be limited.

(c) Permits must be storable for certain time period.

(d) The transaction cost of permits should be limited.

(e) The penalty imposed on the polluter (without permits or beyond the permissible level) should be greater than the price of the permit.

(f) The regulator should take the permit back from the potential polluter only in some exceptional cases to maintain stability in the market.

(g) The sellers of permit should be allowed to enjoy the profit which they earn from trading of permits.

Thus, the tradable permit system has evolved as a less costly alternative to pollution tax. However, if there are multiple polluters than this policy design demands greater care.



CHECK YOUR PROGRESS

Q 4: How is the demand curve for tradable pollution permit derived? (50 words)

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Q 5: Who determines the number of permits given to the polluters in an economy? (10 words)

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_ _

Q 6: When is it profitable for a producer to sell permits to other producer? (40 words)

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12.5 LIABILITY RULE

12.5.1 Non-Compliance Fees

This method is a combination of subsidies and random fines. If the level of pollution in a particular area exceeds the targeted standard, the regulating authority selects at least one polluter randomly and charges fine. The regulator then redistributes a portion of this fine minus the damages to society from non-compliance back to the other producers. Thus, the polluting units have to pay fine and non-polluting units get rewards. The random penalty mechanism increases the expected cost of pollution. If this method is designed properly, it will induce the target control level without actually having to monitor the actions of the polluters. The greatest advantage of this method is that its implementation requires less information than the pollution tax. The non-compliance fees method needs information on the total amount of pollution in a particular location, information on pollution made by the individual producer is not required. However, pollution tax requires information on pollution made by each and every individual producer which is costly both in terms of time and money. However, this method works only when the producers are risk averse.

12.5.2 Deposit Refund System

Under this system the buyers of a potential polluter have to make some additional payment, which is refunded to them when they return the product or its container to an approved centre for proper disposal or recycling. For example, while climbing the Mount Everest the climbers leave empty oxygen cylinders on the summit.

As per the rule of the government of Nepal, if anyone can collect and return such empty cylinders to the authority they are paid some dollars. Similarly, over the years this method has been applied all over the world to control the disposal of beverage containers. In such case someone may throw such containers on the road. However, someone else may be interested to depositing it to the appropriate authority and get back the refund. Thus, this method awards people with good environmental behaviour and impose cost on those people with bad environmental behaviours.

12.5.3 Performance Bonds

Under the system of performance bonds, the producer posts a bond before operation begins, forfeiting the bond if his activities cause environmental harm or the level of pollution caused by his activities is more than the acceptable levels. The bond increases the cost of pollution, which ultimately discourages polluting activities. This method can be applied when the damages to the environment is clear cut. This method may be applied to surface mining. One of the benefits of the performance bonds is that the potential damages to the environment is to be registered before starting production. The potential damages are open to public debate and scrutiny. Thus the burden of potential pollution is shifted to the producer from the society.

The value of the bond is determined by the potential impact of the producer on environment. The value of the bonds can be reduced if the producer can prove that the damages of his activity are less than the cost of the posted bond. Therefore, the producer has the incentive to invest more on research and development to discover new method of production which is less polluting or to discover the true value of the environmental damages.

However, performance bonds are rarely used in reality to control pollution because of its certain limitations. The limitations of this method are:

(a) There may be the problem of moral hazard, if the action of the regulator is not observable. Suppose the regulator is interested in maximising his own private profit than the social welfare. In such situation the regulator (government) may label the producer as a polluter and thereby not refund the value of the bond. So, there should be some third party (court) to judge in this situation.

(b) The second limitation of this method is that there may be liquidity constraints. As the producer has to post the bond before starting the business, the producer may not have sufficient fund for it.

(c) Imperfect contact enforcement may affect the performance of the bond.



CHECK YOUR PROGRESS

Q 7: What is the assumption regarding the attitude of the producer towards risk in Non-Compliance Fees method? (20 words)

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Q 8. Give an example of a market where deposit refund system is commonly used? (10 words)

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Q 9. What are the limitations of performance bond method? (100 words)

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12.6 LET US SUM UP

It may be concluded that the above discussed measures give incentive to the potential polluters to reduce pollution. The producers are

benefited or awarded by the government if they succeed in reducing pollution. However, the effectiveness of these methods depend on the acquiring of information about the behaviour of the potential polluters.



12.7 FURTHER READING

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12.8 ANSWERS TO CHECK YOUR PRGRESS

Ans to Q No. 1: If the rate of pollution tax is equal to the marginal external cost (negative externality), it is called Pigouvian tax.

Ans to Q No. 2: Externality exists when one economic agent's (consumer or producer) action (consumption or production) affects another agent's welfare directly rather than through market price or quantity.

Ans to Q No. 3: Marginal external cost is the difference between marginal private cost and marginal social cost

Ans to Q No. 4: The marginal abatement cost (MAC) curve of an individual polluter indicates its demand for permits. The summation of MAC of all the polluters indicates market demand for permits.

Ans to Q No. 5: The number of permits given to the polluters in an economy is determined by the regulatory authority.

Ans to Q No. 6: If the marginal abatement cost of reducing pollution is less than the price of the permits, it is profitable for the polluters to sell their permits.

Ans to Q No. 7: Under non-compliance fees method the potential polluters (producers) are assumed to be risk averse.

Ans to Q No. 8: Deposit refund system is commonly used to control the disposal of beverages containers.

Ans to Q No. 9: The limitations of the performance bond method are:

- There may be the problem of moral hazard. If the regulator is interested in maximising his own private profit than the social welfare, it may label the producer as a polluter and thereby not refunding the value of the bond.
- As the producer has to post the bond before starting the business, the producer may not have sufficient fund for it.
- Imperfect contact enforcement may affect the performance of the bond.



12.9 MODEL QUESTIONS

Short Questions (Answer each question in about 150 words)

Q.1: Discuss the system of deposit refund.

Q.2: Explain how performance bonds are used to control pollution.

Q.3: What is the difference between command and control policy and economic incentive measures to control pollution?

Long Questions (Answer each question in about 300-500 words)

Q.1: Explain pollution tax measure to control pollution.

Q.2: Discuss tradable pollution permit method to control environmental pollution.

Q.3: Discuss different liability rules to control pollution.

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UNIT 13: ENVIRONMENTAL PROTECTION AND ECONOMIC DEVELOPMENT: INDIAN EXPERIENCE

UNIT STRUCTURE

13.1 Learning Objectives

13.2 Introduction

13.3 Structure of Indian Environmental Regulatory Policies

13.4 National Policies for Environmental Management

13.5 Structure of Enforcement Institutions

13.6 Legal Frameworks

13.7 Monitoring and Enforcement

13.8 Let Us Sum Up

13.9 Further Reading

13.10 Answers to Check Your Progress

13.11 Model Questions

13.1 LEARNING OBJECTIVES

After going through this unit, you will be able to

- clearly define and explain the environmental regulation.
- discuss various environmental policies and laws in India.
- explain the structure of environmental policies, its enforcement and monitoring.
- describe the structure of environmental regulation enforcement institutions in India.

13.2 INTRODUCTION

The basic life support system in our surrounding is the environment. It consists of both natural and human made phenomenon. As discussed in earlier chapters, natural environment refers to both living and non-living organism whereas human environment is the things created by human beings. The natural environment has been modified by human being with

their activities over the years which have endangered the very existing of natural environment. As per Environmental (Protection) Act, 1986, environment includes all the physical and biological surroundings of an organism along with their interaction. Thus, environment is defined as 'the sum total of water, air and land and interrelationship that exists among them and with the human beings, other living organism and materials.' Economy and environment are closely interrelated. Environment supplies energy, raw materials and amenity to the economy and it acts as a receptor of the waste products. Environment has the absorption capacity of waste. The problem arises when it cross the threshold limit. Regulatory policies are required to prevent environmental degradation and preservation of the natural eco system. Due to mechanization of agriculture and rapid industrialization in India over the years, there is an urgent need for environmental regulation in terms of environmental policies. Various acts have been passed by the country before and after independence to create a proper regulatory mechanism for preservation of the quality of environment.

13.3 STRUCTURE OF INDIAN ENVIRONMENTAL REGULATORY POLICIES

Prior to Independence, various acts have been passed in India to protect the environment and human beings from pollution. Some of the Acts passed before the independence are:

- The Shore Nuisance (Bombay and Kolava) Act 1853
- The Oriental Gas Company Act of 1857
- Indian Penal Code of 1860
- The Indian Easement Act of 1882
- The Bengal Smoke Nuisance Act of 1905
- The Indian Motor Vehicle Act
- The Factories Act,
- The Mines and Minerals (Regulation and Development) Act
- The Industries (Development and Regulation) Act
- The Forest (Conservation) Act,
- The Merchant Shipping Act.

All these acts were enacted to control environmental pollution which endangered life. These Acts were implemented in the form of imprisonment, penalties, tax levied and compensation.

After Independence, India became the first country to include an amendment of safeguarding the environment into its constitution. The constitution permitted the states and empowered them to frame policies and rules to implement the pollution control measures in their respective jurisdiction. Accordingly, Uttar Pradesh, Tamil Nadu, West Bengal, Maharashtra, Orissa, Punjab, Jammu & Kashmir and Mysore have passed various Acts in their respective states which suit their situation during the time period 1950 to 1960.

The Environmental measures adopted in 1950s and 1960s were mostly dealt with the issues like sewage disposal, public health, and sanitation. Such measures were implemented by various ministries. In order to coordinate uniformly, a National Committee on Environmental Planning and Coordination (NCEPC) was set up under the Department of Science and Technology in February 1972. In 1981, NCEPC was set-up as National Committee on Environmental Planning (NCEP). It was the highest advisory body that looks after the matter related to environment protection and improvement related issues.

In Januaruy1980, Tiwari Committee was set-up to strengthen the administrative measures and to recommend more such measures. In compliance with the recommendation of Tiwari Committee, the Department of Environment (DoE) was established in 1980 to work in environmental related matters of the central government. The Department of Environment took steps such as monitoring of air and water quality, establishment of environmental information system, promotion of environmental research and the coordination between federal, state and local governments. However, due to some limitations of DoE, the ministry of Environment and Forest (MoEF) was created in 1985 under the regime of Rajiv Gandhi Government. The ministry, which was more comprehensive and institutionalized compared to the previous department, consists of a union ministers and ministers of states. The department was functioned with the same works as the previous department along in addition to the promotional works on environment.

In view of continuous decline in the quality of environment, the central government enacted, adopted and expanded stronger policies and reorganized the administrative agencies. The government has adopted the National Conservation Strategy (NCS) and policy statement on Environment and Development. The policy of 'Sustainable Development' was adopted under this strategy and with this, the government declared to re-orient the policies and action in accordance with the environment perspective. Usually, development leads to the degradation of environment, especially industrial development and related matter, and the initiatives taken for the development of the country may bring the environment related problem. Thus, the ministry of Environment and Forest completed the environmental action plan to integrate environmental considerations into developmental strategies at the time of entering into the era of liberalization, privatization and globalization in 1990. The ministry has issued various standards and incentives to follow the cleaner and environment friendly technologies for the protection of environment along with the economic development.

Environmental concern has been an important part for the world community from the very earlier period but the international conference at Stockholm in 1972 has influenced many countries in the world. Influenced by this concern, India has inserted specific provision for the protection of environment in the 42nd Constitutional amendment Act 1976 under Article 48A of the Directive Principles of State Policy and Article 51A (g) of the Fundamental Duties. It is enshrined in the Constitution that every citizen of India has to protect and improve the natural environment. The enforcement and monitoring of these legislations is vested to the Supreme Court and High Courts of the country.



CHECK YOUR PROGRESS

Q 1: Define Environment (Answer in about 20 words)

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Q 2: What is command and control measure? (Answer in about 20 words)

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Q 3: What is Environmental regulation? (Answer in about 30 words)

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Q 4: What is the purpose of enacting various environmental regulations and in which form it is being implemented? (Answer in about 40 words)

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Q 5: Which international event has influenced the Indian Government to insert the special provision for the protection of environment in the Constitution of India? (Answer in about 30 words)

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13.4 NATIONAL POLICIES FOR ENVIRONMENTAL MANAGEMENT

In addition to the fundamental rights and duties in respect of environmental matter, there are other national policies for the governance of environmental management in India. National Policy on Pollution Abatement (NPPA, 1992), National Conservation Strategy and Policy Statement on Environment and Development (NCS & PSED, 1992) and National Environment Policy of 2006 are the examples of such national policies. The ministry of Environment and Forest is the main implementing agency of these policies. In terms of judicial guaranty, it is not judicially enforceable but the judiciary can guide the central and state governments in implementing these policies. The various national policies for environmental management have discussed below:

- National Policy on Pollution Abatement (NPPA, 1992): Under the National Policy on Pollution Abatement (NPPA 1992), various economic instruments are used to control the pollution. It adopts the techniques such as prevention of pollution at the source, adoption of best technologies, polluters pay system and involvement of public in decision making. These are used to integrate the environmental considerations into decision making.
- National Conservation Strategy and Policy Statement on Environment and Development (NCS/PSED 1992): It provides the framework for conservation of natural resources and economic development by keeping the utmost care on environmental management. It promotes the policy by conducting environmental impact assessments, educational campaigns and by ensuring public participation in such issues.
- National Environment Policy of 2006: It is the authoritative declaration by the government's commitment to improve the environment while promoting economic development. The protection of environment is also mandated under Articles 48 A and 51 A (g) of the Constitution. The policy was initiated with the objective to conserve environmental resources which are in critical situation, generation wise equity in resource use, intra-generational equity and securing livelihood of the poor, integration of social and economic development with environment, good environmental governance, enhancement and efficiency in resource use. The policy mainstreams the environmental principles in all relevant economic development process.

The main theme of the National Environmental Policy was to do away with the excessive degradation generated mostly through the establishment of polluting industries, high population growth, inappropriate technology and consumption choice, intensive agriculture etc. by adopting the sustainable development pattern in the process of economic and social development. The policy tries to conserve environment while securing livelihood and well-being of all human community. The policy brings the

public agencies, local communities, academicians, investment community and all other international and national stakeholders in one forum to involve in the management of environmental resources.

13.5 STRUCTURE OF ENFORCEMENT INSTITUTIONS

In India, the responsibilities to manage, plan, promote and coordinate the environmental related activities throughout the country are with the Ministry of Environment and Forest. It formulates the national policies, standards and regulations with the objective to protect and conserve its flora and fauna, wildlife and protect the environment from pollution. The ministry is a political branch of country's environmental organization and has the authority to create autonomous bodies to enforce the environmental laws throughout the country. The ministry has established a board called Central Pollution Control Board (CPCB). The board has oversight power over state boards under the Ministry of Environment and Forest. It was established in 1974 under the Water(Prevention and Control of Pollution) Act. The board has the responsibilities to advice the central government to prevent and control water and air pollution in the country. It develops plans and programs to prevent the environment and coordinate with State Pollution Control Boards (SPCBs) in resolving these issues. The board consists of full time chairman, member secretary appointed by MoEF and representatives from central, state boards, private sector and government corporations. The CPCB serves as the national environmental agency and its central office is located at Delhi. The board has six zonal offices at Bengaluru, kolkata, Bhopal, Vadodara, Kanpur, Lucknow, Shillong and a project office at Agra.

The primary focus of the board was to develop national strategies to address environmental problems and to assist technical guidance and compile information about environment compliance for public as well as for government use. They impart training to staffs and sometimes organize mass media awareness on environmental related activities. The zonal offices of CPCB are the main implementing agencies. They implement the

environmental policies of the government through conducting the inspection, providing technical assistance to the regulated communities. They develop recommendations and also respond to CPCB and court issued directions.

In state level, SPCBs were established by the states in their respective jurisdiction following the national level structure. The state level boards were basically established to adopt the water Act 1974 and Air Act 1981. In the state, the environmental regulations are divided between the State ministers of environment and SPCBs. SPCBs in most states are attached to the department of environment and forest and with the department of wildlife. The state ministers appoint the state board and manage the environmental policies in the state. On the other, SPCBs have the responsibilities to manage routine environment management programs. Akin to the CPCB, the SPCBs have the responsibilities to advice the government on pollution related matters. It grants consent to establish and operate under water and air acts. The board has authorized to implement and enforce the national programs and look after the hazardous disposal under EP Acts. It also plans state level pollution control, prevention and abatement under its jurisdiction. The SPCBs have the chairman and member secretary that look after the regulations and develops the state guidance to maintain the regulations. In some large states, the sub- regional offices are also established to reduce the response time and to resolve the complaints.



CHECK YOUR PROGRESS

Q 6: What is the role of Judiciary in Environment related policies? (Answer in about 20 words)

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Q 7: Write the full form of CPCB and SPCB? (Answer in about 20 words)

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Q 8: What are the economic instruments used to control the pollution? (Answer in about 30 words)

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Q 9: Mention the role of CPCB. (Answer in about 30 words)

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Q 10: What is the main objective of National Environmental Policy 2006? (Answer in about 40 words)

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13.6 LEGAL FRAMEWORKS

In view of the rapid decline in the area under forest and biodiversity due to the increasing deforestation in the country, various laws for the forest and biodiversity are incorporated in the national policies of the country. The Indian Forest Act of 1927, Forest (Conservation) Act of 1980, Wildlife (Protection) Act of 1927 and Biodiversity Act of 2002 are the examples of such policy outcome to conserve and promote the forest and wildlife.

- **Indian Forest Act of 1927:** The Indian Forest Act of 1927 is the result of the replacement of previous Forest Act of 1865 introduced by the British colonial as a claim on Indian forest. The objective of the act was to make previous forest law more efficient and to regulate law related to forest and its produce. Under section 3 and 4 of this act, the state government has the power to declare forest, land, waste land as reserve area. After the recognition of these resources as reserves, all the individuals and community which previously have rights over the resources has to take prior permission from the regulating authority for its use. The state government can also make rules to manage the village forest under which the villager can use the forest products under some conditions recommended by the authority. Section 28 of the forest act also gives state government the right to make rules to assign duties to the people for the protection

and development of forest. Section 29, 30, 32 and 33 of the act deals with the declaration of protected area, regulating the rights and privileges for the use of protected forest and penalizing in case of violating through the collection, changing and using of these resources without license.

- **The Forest (Conservation) Act of 1980:** The ecological imbalances posed by rapid deforestation leads to the introduction of new and stronger act which came to be known as Forest (Conservation) Act of 1980. This act was enacted everywhere in the country except in Jammu and Kashmir. It sets restriction on deforestation and use of land for non-forest purpose. Under this act, no state or authority has the right to approve for the clearance of forest or give any resources to any private person or any other agencies without the approval of the central government. Any contravention of provisions of the act by any people including head of the government departments, organizations, corporate and other stakeholders are to be penalized on the basis of the offence made by them. Under section 3-A of this act, individuals that contravene will be punished and this punishment ranges from a simple imprisonment period which may also extend to a period of fifteen days imprisonment.
- **The Wildlife (Protection) Act of 1972:** This act was passed by the parliament under the article 252 of the constitution on the request of eleven states of the country. This act provides the comprehensive national legal framework for wildlife conservation. The main objective was to protect the wild animals, birds and plants. The act was amended in the year 2002 which was named the wildlife (protection) amendment act 2002. It gives the central government to declare areas as sanctuary and national parks. The central government appoints wildlife warden and other officer and employees for the compliance of the act. The state governments also appoint the forest warden for the similar functions. The act also empowers the central government to constitute the National Wildlife Board to consider the

proper measures to promote, protection and development of wildlife. The state governments also constitute similar kind of boards in their respective states for the protection of forest.

- **The Biological Diversity Act of 2002:** The act was basically developed to conserve the biological diversity. Along with the conservation, the act also aims sustainable and equitable share of benefits that originates from the biological resources. For instance, biological resources, knowledge and all the resources connected to the biological diversity. The act prohibits the person to take any biodiversity related activities without the approval and prohibits the person to transfer any biological resources to other foreigners or any other agencies. Prior permission is required to seek for the application of intellectual property right and for obtaining resources for commercial utilization. National Biodiversity Authority was constituted under this act and the board has been setting rules regarding the matter related to the conservation of biodiversity. State governments and the local level governments have the power to set up the rules for the management of biodiversity in their respective jurisdictions.

These are the legal provisions made by the authority to conserve the rich biodiversity of the country. It has been seen from the very early period that the environmental resources are degrading which further affects the biodiversity of the earth. Thus, these acts and policy frameworks are a milestone in an attempt to preserve these resources of the earth. In addition to the forest and biodiversity acts, various other provisions also made to address the environment related issues. Even after the implementation of many regulations and policies, the environmental issues were not given priority.

The international conference held at Stockholm has made an impact among the world communities about the environmental related issues. In India too, a serious consideration has been made for the environmental related matter in the form of many legal frameworks. These are Water (Prevention and Control Pollution) Act 1974, Water Cess Act of 1977, Air

(Prevention and Control Pollution) Act of 1981, Environmental (Protection) Act of 1986 and Public Liability Insurance Act (PLIA) of 1991.

- **The Water (Prevention and Control Pollution) Act:** It has been enacted in 1974 and amended in 1988. The SPCBs are the primary agencies to establish and enforce the act. They are authorized to set to the standard effluent facilities for discharging pollutants in water bodies. CPCB are authorized to enforce the same in Union Territories. Both the CPCB and SPCBs have the right to establish domestic and industrial discharge policies through the consents to establish (CTE) and consents to operate (CTO).
- **Water Cess Act of 1977:** Under this act, cesses on water are collected for the consumption of water by the persons carrying certain industrial activities or by some local authorities. The imposition of levy and collection of cess are made under this act. This act complements the Water (Prevention and Control Pollution) Act of 1974 by providing required resources to the CPCB and SPCBs for the management of their assigned responsibilities.
- **Air (Prevention and Control Pollution) Act of 1981:** The development of Air (Prevention and Control Pollution) Act in 1981 was the result of initiating stronger policies to monitor the environmental issues in the country. It provides framework for the prevention, control and abatement of air pollution. The implementation of this act is similar with the water act. Both the CPCB and SPCBs were assigned to do the same responsibilities as in case of water act.
- **The Environmental (Protection) Act of 1986:** The Environmental (Protection) Act of 1986 provides the policy for environmental protection considering water, air and land. The central government is advised to set and establish the procedures for managing hazardous substance and regulate industrial pollution. The government is assigned to establish laboratories to collect pollution samples and also to investigate and research the pollution issues and disseminate the same information. Initially, the SPCBs were

the primary enforcement authority of water and air acts in India. CPCB was authorized to enforce against the violators in Union Territories. CPCB was vested the authority of Environmental Protection Act in the country. Later on, CPCB were kept as the back-up enforcement responsibilities and provided the authority to conduct special enforcement responsibilities.

- **Public Liability Insurance Act (PLIA) of 1991:** Under Public Liability Insurance Act (PLIA) of 1991, the business owners operating hazardous substances are mandatory to take out insurance policies covering the accidents associated with such hazardous things.

In view of continue environmental degradation and the occurrence of Bhopal gas Tragedy necessitated the introduction of more stringent policies which results in the introduction of these acts in the country.

Additionally, various other regulations such as, sub-ordinate, criminal and appellate courts are also engaged and exercising power under various sections of Indian penal code dealing with offences related to environment. Criminal courts deals with the offences created under section 41-50 of Water Act, section 37-47 of Air Act and section 15-17 of EP Act. All the powers are exercised in their respective territorial jurisdiction. Appellate authority act of 1997 constituted to deal with the appeals on area restrictions where the industrial operations are or will be carried out. These kinds of deals are governed by various departments of government and the respective officers. Some states have also constituted the green bench to hear the environmental issues. Despite of these provisions, priority on environmental issues are comparatively less. Hence, specialized environment courts are also provided to deal with the environmental cases. Through these courts, it is expected to resolve the environmental cases immediately and it also allows the courts to advice on environmental matter.

13.7 MONITORING AND ENFORCEMENT

The employees appointed in the central office, zonal offices of different regions and states are responsible for implementation and enforcement of environmental regulations in the country. The headquarter

staffs are responsible for preparing various strategies, preparing reports on activities and successes, developing technical assistance, reviewing zonal recommendations, resolving environmental violations, advising member secretaries for proper enforcement, attending public complaints, implementing and monitoring court issued order and providing administrative support to the enforcement agencies.

The implementation of the environmental regulations is done through following ways by the employees:

i. Conduct surprise inspection in the polluting industries.
ii. Conduct performance evaluation of pollution control measures
iii. Conduct surveillance of water and air quality.
iv. Address public complaints, make problem area action plans and maintain court directives.
v. Conduct pollution assessment other than industries.
vi. Update pollution sources.
vii. Review solid waste management practices etc.

The CPCB office conducts formal enforcement actions through inspections. As a commitment under annual action plan, the CPCB conducts inspection in the request of zonal offices and state boards and sometime CPCB themselves conduct unplanned inspection or follow new court directives. Usually, the zonal office determines the extent of violation by collecting sample and inspects the facility. The office writes reports and upon identifying the violations they also makes recommendations. The CPCB reviews the recommendations and sometime forwarded to head of the zonal office and gives the final decision in resolving the matter. Chairman and member secretary can refer the case to SPCBs for needful action.

Thus, the main compliance monitoring instruments are permit, inspection, self-monitoring and reporting. Under the permit instrument, all the polluting facilities have to legally acquire the permission from respective SPCBs to establish or operate the industrial activities. As per the MoEF, all those interested, to start any industrial project, required to collect environmental clearance of category A from CPCB or category B from SPCBs based on environmental impact assessment. Establishment permit

is generally given after the evaluation of potential environmental impact of the project and after the installation of pollution control measures. The operation permit is issued after the verification of compliance conditions and the necessary inspection on the emission and effluent limits based on industrial sector specific standards. Industries those involved in handling hazardous, bio-medical waste and municipal wastes are also required to obtain authorization from the compliance agencies.

The frequencies of inspection are decided through the identification of potential pollution. The potential pollution is categorized into red, orange and green and through the size of capital investment. The areas which contain less pollution are visited lesser compared to the high potential pollution areas. Sometimes, SPCBs also do the site visit on receiving the complaints from the public and sometimes as a renewal process for the consents. Inspections are usually done covering air, water and land waste altogether and generally unannounced. After the inspection, the inspection team prepares reports and prioritizes the areas or projects that needed more environmental measures.

Self-monitoring and reporting is another compliance method required to present by each polluting facilities and it is a mandatory compliance method put forwarded by the environmental protection rules of 1986. The reporting facilities have to submit the self-monitoring reports to the authority at the end of each financial year. The report should include the raw materials used, air and water pollution discharge, solid waste generation, recycling and disposal of waste and other pollution measures. Other area based measures were also initiated so that it can focus on speedy compliance monitoring of regulations.

Administrative response is done through the measures like cut off of power or water supply of various polluting industrial facilities that violates the regulations. Thus, along with the Administrative and Legislative set up, India has also made judicial provision for protection of environmental regulations. Both Supreme Court and high courts have the concurrent rights to monitor the regulations. A court can impose criminal penalties on violating the environmental regulations. The imprisonment of 18 months to

6 years along with fines is also applicable to the violating individuals or agencies. On violation of mandatory regulations, the government can seek damage compensation. The citizen of the country has also entitled the fundamental rights to clean environment and has the duties too to protect the environment. Thus, these courts are provided to exercise the power of securing fundamental rights of citizen under article 32 and 226 of the constitution and have the responsibilities to check the expected violations by the citizen of the country.

For the compliance of the environmental laws in the country various assistance have been provided such as training and technical assistance, compliance assistance information, charter on corporate responsibilities for environmental protection, awareness campaign and data management etc.



CHECK YOUR PROGRESS

Q 11: Potential pollution is categorized into how many categories? (Answer in about 20 words)

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Q 12: Which Indian Environment Act is the replacement of previous act introduced by British in India? (Answer in about 30 words)

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13.8 LET US SUM UP

- The policies on environmental issues in the country reflect that the protection of environment has been a priority for the government from the very early period.
- The government has enacted various acts and legal frameworks for the smooth implementation of the environmental regulations but in spite of such attempts it has been given less priority in terms of enforcement and compliance compared to other issues.

- All the regulations are initiated and supervised under the Ministry of Environment and Forest through various sub-departments and sub-authority constituted by the ministry.
- Along with all the regulations, acts, legal support and constitutional provisions, the Supreme Court and the High Courts of the country are also assigned to look after the environmental rights and duties of the citizen of the country.



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13.10 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: Environment is defined as the sum total of water, air and land and inter-relationship that exists among human beings, other living organism and materials

Ans to Q No 2: Under the command and control measure, regulator has to specify the steps individual polluters must undertake to solve a pollution problem.

Ans to Q No 3: Environmental regulation is a special and relatively recent example of economic regulation which aims to protect the environment. Pollution fee is a payment charged on per unit of pollution generated.

Ans to Q No 4: The main purpose of enacting various environmental regulations is to control environmental pollution which endangered life. These regulations are implemented in the form of imprisonment, penalties, tax levied and compensation etc.

Ans to Q No 5: The International Conference at Stockholm in 1972 has influenced India to insert special provision for the protection of environment in the Constitution of India.

Ans to Q No 6: The Judiciary can guide the Central and state governments in implementing environmental policies.

Ans to Q No 7: The full form of CPCB is Central Pollution Control Board and SPCB is State Pollution Control Board

Ans to Q No 8: The economic instruments used to control the pollution are prevention of pollution at source, adoption of best technologies, polluters pay system and involvement of public environmental related decision making.

Ans to Q No 9: The CPCB was established in 1974 under the water Act and it serves as the national environmental agency and its central office is located at Delhi.

Ans to Q No 10: The main objective of National Environmental Policy 2006 was to conserve environmental resources which are in critical condition, generation wise equity in resource use, inter- generational equity and security livelihood, integration of social and economic development and enhancement of resource use efficiency.

Ans to Q No 11: The potential pollution is categorized into red, orange and green and through the size of capital investment.

Ans to Q No 12: The Indian Forest Act of 1927 is the result of the replacement of previous Forest Act of 1865 introduced by the British colonial as a claim on Indian forest.



13.11 MODEL QUESTIONS

Short Questions (Answer each question in about 150 words)

Q.1: What is Environmental Kuznets's Curve (EKC)? Explain

Q.2: Environmental Measures adopted in 1950's and 1960's mainly deals with which issues?

Q.3: List the main instruments for the compliance of environmental laws in the country?

Q.4: Discuss the role of Ministry of Environment and Forest?

Long Questions (Answer each question in about 300-500 words)

Q.1: What is 'Sustainable Development'? Why it is necessary to consider Sustainable Development while framing economic development policies?

Q.2: How do the employees of the Environment department implement the environmental regulations in India?

Q.3: Define the basic features of

a) Indian Forest Act of 1927

b) The Forest (Conservation) Act of 1980

c) The Wildlife (Protection) Act of 1972

d) The Biological Diversity Act of 2002

e) The Environmental (Protection) Act of 1986

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UNIT 14: GLOBAL CONVENTIONS FOR ENVIRONMENTAL CONSERVATION; CONCEPT OF 'COMMON BUT DIFFERENTIATED RESPONSIBILITIES'; CAUSE OF NON-COOPERATIVE BEHAVIOUR AMONG NORTH AND SOUTH

UNIT STRUCTURE

14.1 Learning objectives
14. 2 Introduction
14.2 Global conventions for Environmental conservation
14.3 Concept of 'Common but Differentiated Responsibilities'
14.4 Cause of Non-Cooperative Behaviour among North and South
14.5 Let Us Sum Up
14.6 Further Reading
14.7 Answers to Check Your Progress
14.8 Model Questions

14.1 LEARNING OBJECTIVES

After going through this unit, you will be able to

- know about important environmental conventions and protocols held for environmental protection
- know and describe the importance and significance of these conventions and protocols for preservation and protection of environment
- learn the concept of common but differentiated responsibility (CBDR)
- describe the implications of CBDR
- discuss the causes of non-cooperative behaviour among North and South group of countries regarding environmental problems

14.2 INTRODUCTION

As pollution and environmental degradation is a negative externality and it spread over the frontier of a nation, it is necessary to global convention for environmental protection.

14.3 GLOBAL CONVENTIONS FOR ENVIRONMENTAL CONSERVATION

During 1970s, when environmental problems spread over beyond the frontiers of a nation, international efforts were seen to combat these issues. After the Second World War, almost all countries of the world have witnessed tremendous growth process not only in home production but also in international trade. It enhanced the scope of trans frontier pollution. As a result, international efforts were seen to mitigate the issues of environmental conservation. In the following we will discuss the global conventions and protocols.

- **Stockholm Conference on Human Environment (1972) June 5-16, 1972:**

This conference was the first to be held in seventies in a series of major UN conferences which made an in depth study of the environmental problems and the consequences connected there with and also the need for doing something substantial with the cooperation of the nations of the world. At later phase, it covered problems of pollution, food, women's rights, desertification, human settlements, Science and technology and other similar topics. The Stockholm conference created enthusiasm and hope among all the countries. In order to generate political will to sort out the issues, this conference created the United Nations Environment Programme (UNEP). This conference agreed upon a Declaration containing 26 principles concerning environment and development. Some important principles are-

1. Natural resources must be safeguarded, 2. Non-renewable resources must be shared and not exhausted, 3. Pollution must not exceed the environment's capacity to clean itself, 4. Development is needed to

improve the environment, 5. Rational planning should resolve conflicts between environment and development, 6. International organisations should help to improve the environment, etc. Stockholm conference recognised alleviation of poverty for protection of environment and also motivated countries around the world to monitor environmental conditions as well as to create environmental ministries and agencies.

- **Ramsar Convention (1971):**

Wetlands are among the most diverse and productive ecosystems. They provide essential services and supply all our fresh water. However they continue to be degraded and converted to other uses. The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world". Under the Convention, the Contracting Parties commit to:

- Work towards the wise use of all their wetlands;
- Designate suitable wetlands for the list of Wetlands of International Importance (the "Ramsar List") and ensure their effective management;
- Cooperate internationally on transboundary wetlands, shared wetland systems and shared species.

- **Vienna Convention (1985):**

It is a multilateral environmental agreement signed in 1985 for the protection of the ozone layer. Signed in Vienna conference, it provided frameworks for international reductions in the production of chlorofluorocarbons (CFCs) due to their contribution to the destruction of the ozone layer. It is one of the most successful treaties of all time and it provides scope for sharing of climate and atmospheric research to promote knowledge of the effects on the ozone layer. The treaty calls for the adoption of international agencies to assess the harmful effects of depleted ozone and also the promotion of policies that regulate the production of harmful substances that influence the ozone layer.

- **The Montreal Protocol (1987):**

The Montreal Protocol is an international treaty designed to protect the ozone layer from depletion by phasing out the production of numerous substances like Chlorofluorocarbons (CFCs) and other halogens. According to Montreal protocol, the USA, along with other 24 industrial nations agreed to freeze their emissions of nitrogen oxides which are thought to be responsible for acid rain. Further, the Montreal protocol pledged to reduce the release of CFCs by 20 percent by 1994, and further by 30 percent by the end of 20th century; and also phase out productions of halogens. Montreal protocol is considered to be historic in spite of its shortcomings. This was the first international effect to recognise pollution as a global threat, and the need for concerted effort by all countries of the world.

- **Basel Convention (1989):**

The European Economic Community and Thirty Five nations of the world met at Basel in Switzerland in March 1989 to limit and control international transport and also disposal of hazardous waste. The report of Basel convention contains 29 articles and some important ones are-

1. Signatory states are prohibited from transporting hazardous waste to another state which had banned the import of it.
2. Every country has the right to refuse acceptance of a shipment of hazardous waste.

This treaty declared traffic in hazardous wastes as criminal offence.

- **United Nations Conference on Environment and Development (UNCED) at Rio De Janerio, (June, 1992) (Agenda 21):**

In June, 1992, 178 nations of the World participated in the historic "Earth Summit" held at Rio De Janerio. From a legal and institutional standpoint, the Earth Summit produced three important agreements. These were: (i) the Climate convention, (ii) the Biodiversity convention, and (iii) Agenda 21. In addition, the participants at UNCED agreed to a statement of principles known as the Rio Declaration. Each of these instruments established important precedents and underlined the continuing relationship between issues of economic development and environmental protection. Taken together, they set the agenda on global environmental issues for the next several decades.

i) The Climate Convention:

The United Nations framework Convention on Climate Change (UNFCCC) came into effect from 21 March 1994. The aim of this agreement is to stabilize atmospheric concentrations of greenhouse gases at level that will prevent human activities from interfering dangerously with the global climate system. In ratifying the Convention, Governments agreed to reduce emissions of the warming greenhouse gases to "earlier" (of 1990) levels by the end of the year 2000. States are required to report periodically on their level of emissions and efforts to slow climate change. The target of reducing carbon dioxide emissions to 1990 levels by the end of the year 2000 - which was advocated by the European Community, Japan and most other countries but opposed by the United States - is stated as a goal to be met voluntarily. To enable developing countries to meet their obligations under the convention, developed countries agree to provide 'new and additional' financial assistance. Such assistance is, for the time being, to be channeled through the Global Environment Facility, a fund administered jointly by the World Bank, the UN Development Programme and the UN Environment Programme.

ii) United Nations Convention on Biological Diversity (CBD):

Negotiated under the auspices of UN Environment Programme (UNEP), this convention was aimed at preserving global biological diversity through the protection of species and ecosystems. Since most of the threats were being experienced in developing countries, and most biotechnology was based in developed countries, discussions were again based around attempts to reach a compromise between the needs of the two sides. The four main goals of the convention are:

1. Conservation of biological diversity
2. Sustainable use of its components
3. Sharing the benefits of genetic resources fairly and equitably
4. Compensation to developing countries for extraction of their genetic materials.

The two protocols related to CBD are: (a) Cartagena Protocol on Biosafety, 2000 (b) Nagoya Protocol (Biodiversity Accord), 2010.

iii) Agenda 21:

Agenda 21 was intended to be a set of guidelines on environment and development issues for states to follow in the twenty-first century: a sort of guiding principles of sustainable development. It has 40 chapters which are covered in 4 sections. The Agenda covers in great length and details about 'sustainable development' on the planet. It gives importance to poverty which has complex multidimensional aspects. Its proposals cover population policies, health care, education, women, youth, indigenous people and their rights to achieve sustainable livelihood. Food security, clean water, sanitation are also given utmost importance. The protection of fresh water resources, oceans, safe use of toxic chemicals, management of hazardous and radioactive wastes, are discussed in details in the proposal of Agenda 21. Other subjects covered by the Agenda are: controlling spread of deserts, conservation and rational use of forests, environment friendly technologies, creation of environmental awareness and the promotion of international legal instruments etc. its overall provisions find expression in the Rio Declaration.

- **Rio Declaration:**

The Rio Declaration on Environment and Development consisted of 27 principles guiding action on environment and development, and building on the Stockholm Declaration of 1972. The Declaration stated that human beings were at the centre of concerns for sustainable development and set the goal of establishing "a new and equitable global partnership through the creation of new levels of cooperation among States, key sectors of societies and people". The right to development must be fulfilled but at the same time use of environmental resources should be such that needs of future generation should not be compromised. So, it advocated strongly the path of sustainable development. The Declaration states that States should cooperate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries. It also stressed for strengthening indigenous capacity building for sustainable development by improved scientific understanding through exchange and transfer of technologies. In summary, this Declaration

elaborately explains the role to be played by both developed and developing nations to achieve the goals as explained in Agenda 21. The Rio Declaration set the stage for international agreements which would respect the interest of all and protect the integrity of the global environmental and development system.

- **Kyoto Protocol (1997):**

The Kyoto Protocol was adopted in Kyoto in Japan on11 December, 1997 and came into force in 2005. It is an international treaty under UNFCCC that commits state parties to reduce greenhouse gases (GHGs) emission. The emission target includes all 6 major GHGs namely: (a) Carbon Dioxide (CO2), (b) Methane (CH4), (c) Nitrous Oxide (NO2), (d) Sulphur Hexafluoride (SF6), (e) Hydrofluorocarbons (HFCs) and (f) Perfluorocarbons (PFCs). This protocol developed three mechanisms to control emission namely: a) Clean development mechanism, b) Emission trading and c) Joint implementation. Three categories of signatory countries are there in the protocol- a) Annex I countries: industrialized countries and economies in transition, b) Annex II countries: developed countries which pay for costs of developing countries, c) Non-Annex I countries: Developing countries. India is included in the last category. The commitment periods for emission reduction was agreed upon- first period is from 2008 to 2012; second period known as the Doha Amendment to the protocol, is from 2012 to 2020. One important feature of the protocol is that it agrees upon 'common but differentiated responsibility' among countries as it acknowledges that individual countries have different capabilities in combating climate change, owing to economic development. It places the obligation on developed countries to reduce current emissions on the basis that they are historically responsible for the current levels of greenhouse gases in the atmosphere.

- **Rotterdam Convention (1998):**

It is a multilateral treaty to promote open exchange of information and ask exporters of hazardous chemicals to use proper labelling, include directions on safe handling, and inform purchasers of any known restrictions or bans. Signatory nations can decide whether to allow or ban the import of chemicals listed in the treaty, and exporting countries are obliged to make

sure that producers within their jurisdiction comply with the norms. There were 72 signatory countries and 161 parties to the treaty.

- **Stockholm Convention:**

It is an international environmental treaty signed in 2001 and effective from May 2004, that aims to eliminate or restrict the production and use of persistent organic pollutants (POPs). Salient features of the Convention include-a) the requirement that developed countries provide new and additional financial resources and measures to eliminate production and use of intentionally produced POPs, b) eliminate unintentionally produced POPs where feasible, and c) manage and dispose of POPs wastes in an environmentally sound manner. Precaution is exercised throughout the Stockholm Convention, with specific references in the preamble, the objective, and the provision on identifying new POPs. There were 152 signatories in the convention including both developed and developing nations.

- **United Nations Conference on Sustainable Development, Rio+20:**

It took place in Rio de Janeiro, Brazil on 20-22 June 2012. It resulted in a focused political outcome document which contains clear and practical measures for implementing sustainable development. In Rio, Member States decided to launch a process to develop a set of Sustainable Development Goals (SDGs) which will build upon the Millennium Development Goals and converge with the post 2015 development agenda. The Conference also adopted ground-breaking guidelines on green economy policies.

14.4 CONCEPT OF 'COMMON BUT DIFFERENTIATED RESPONSIBILITIES' (CBDR)

- **Definition towards Common but Differentiated Responsibilities:**

The principle of 'common but differentiated responsibility' came from the notion of 'common heritage of mankind' and is a manifestation of general principles of equity in international law. The principle recognises differences in the contributions of developed and developing nations to global

environmental problems on historical background, and also differences in their respective economic and technical capacity to tackle these problems. Though each nation is responsible for environmental problems, it is the developed countries which have contributed more to the problem. So, every State has 'common' responsibility of protecting the environment. Despite their common responsibilities, important differences exist between the stated responsibilities of developed and developing nations on historical ground and capabilities of nations. The Rio Declaration states- "In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command." Similarly UNFCCC states that parties should act to protect the climate system "on the basis of equality and in accordance with their common but differentiated responsibilities and respective capabilities." The principle of CBDR has two fundamental elements. The first one emphasises the common responsibility of States for the protection of the environment, or parts of it, at the national, regional and global levels. The second one recognises the need to take into account the different circumstances, particularly each State's contribution to the evolution of a particular problem and its ability to prevent, reduce and control the problem.

- **Implications of the Principle of CBDR:**

The principle of CBDR has two important consequences. Firstly, it entitles all concerned nations to participate in international response measures aimed at addressing environmental problems. Secondly, it helps nations to set environmental standards that accordingly impose differing obligations on nations.

Common responsibility explains the shared responsibility of two or more nations towards the protection of a particular environmental resource. Common responsibility is likely to be applicable where the resource is shared, or under the control of no State or under the sovereign control of a State. But the resource should be subject to a common legal interest (such as biodiversity – termed as a common concern of mankind).

Differentiated responsibility of States is widely accepted in various treaties and other State practices for the protection of the environment. Differentiated responsibility is based on factors like- historic contributions to the creation of an environmental problem, future economic development of countries, special needs and circumstances of the concerned nations. The Stockholm Declaration clearly emphasises the need to consider the applicability of standards which are valid for the advanced nations but which may not be appropriate for the developing nations. Similarly in Rio Declaration, States agreed on the facts that environmental standards, management objectives and priorities should reflect the environmental and developmental context to which they apply. They also agreed that least developed and developing countries should be given special priority as they are most environmentally vulnerable these countries should be given responsibilities less than the developed countries. So, differentiated responsibility aims to promote substantive equality between developing and developed nations. The aim is to ensure that developing countries can comply with particular legal rules over time. Differentiated responsibilities are generally put to the nations in the technical form of 'grace period', 'delayed implementation' and 'less stringent commitments'. Another salient feature of CBDR principle is international assistance, including financial aid and technology transfer. Since developed countries have played the greatest role in creating most of the global environmental problems, and at the same time have superior ability to address them, they are expected to take the lead on environmental problems. In addition, developed countries are expected to provide financial, technological, and other assistance to help developing countries to fulfil their sustainable development responsibilities while maintaining their own developmental path. In Agenda 21, developed countries reaffirmed their previous commitments to reach the accepted UN target of contributing 0.7% of their annual gross national product to official development assistance. In sum and substance, Countries have common responsibilities to protect the environment and promote sustainability, but due to different social, economic, and ecological situations, countries must shoulder different responsibilities. The principle therefore

provides for asymmetrical rights (different rights for different group) and obligations regarding environmental standards, and aims to induce broad acceptance by the nations of treaty obligations. The CBDR principle also reflects the elements of equity, as it has placed more responsibility on wealthier countries and to those countries more, which are responsible for causing specific global problems. Perhaps more importantly, the principle also presents a conceptual framework for compromise and co-operation in effectively meeting environmental challenges.

14.5 CAUSE OF NON-COOPERATIVE BEHAVIOUR AMONG NORTH AND SOUTH

By the term North (global North) and South (global South) a distinction is drawn between developed and developing countries irrespective of geographical location. The North is mostly comprised of the Western world (previously called “First World”) and much of the “Second World”, while the South mostly comprised of the developing countries (previously called “Third World”) and Eastern world. The global north consists of Australia, Canada, and most Western European countries, Israel, Japan, New Zealand, Singapore, South Korea, Taiwan and the United States. The Global South includes Africa, Latin America and the Caribbean, Pacific Islands, and the developing countries in Asia, including the Middle East. Brazil, India and China are part of it, which along with Indonesia and Mexico, are the largest Southern states in terms of population and land mass. The two groups are generally distinguished in terms of levels of wealth, economic development, income inequality, and political and economic freedom as defined by freedom indices. Countries in the North group are wealthier, developed, and less unequal with more democratic values. They are hub of much advanced technological know-hows, who export technologically advanced manufactured products. On the other hand, Southern states are generally poorer developing countries burdened with poverty, unemployment, poor infrastructure. They are heavily dependent on primary sector exports and most of them were under colonial rule by the Northern states.

Non-cooperative behaviour or popularly known as the 'North-South divide' among the North and South group of countries started in the late 20th century and earlier part of 21st century. Causes of non -cooperative behaviour among these two groups on environmental issues can be drawn from historical legacy, developmental aspiration in economic and political front, social structure, technological divide, world trade regime, globalisation etc.

Economic growth and environmental degradation go together. But economic progress is very essential to combat problems like poverty, unemployment and many other socio-economic issues in developing countries. Rapid industrialisation, urbanisation have posed serious challenges to the developing nations to contain environmental degradation. Developed nations have already well equipped themselves to combat most of the environmental issues with the aid of superior technology and larger command over world resources. Though it is universally acknowledged that protection of environment is a global problem and should be solved globally but in practice it hardly happened due to growing conflicts among North and South groups. We explain some basic causes below:

- **Historical Legacy:**

Developed countries started their growth journey from the period of industrial revolution already causing huge environmental damage during the last two centuries. The developing nations have started mostly after the second world war their endeavour to attain higher economic growth with rapid destruction of environmental resources causing higher level of pollution, hazards ever before, with a view to solving nation's inherent problems as explained earlier. Developmental activities increase carbon emissions and GHGs emission level in the atmosphere. To reduce these emissions, global consensus was necessary and so Conventions and Protocols were initiated. But unfortunately, disagreement occurred between the North and South over responsibility for environmental damage. Whether to measure emissions on an annual basis or on a historical or cumulative basis became point of heated debate. It is to be noted that if calculated on an annual basis, carbon emission level in proportion to GDP would be higher

in developing nations as they are in rapid phase of economic growth and it would create a hindrance to developmental activities while curbing emissions. If calculated on historical or cumulative basis, developed nations would get enough burden to reduce emissions. Eventually, North group wanted emission reduction on current annual basis and South group wanted it on cumulative or historical basis. Again, Developing countries strongly argue that carbon reduction is an impediment to the development goal of poverty reduction and thus raising issues of how to balance eliminating poverty versus mitigating climate change. To negotiate between North and South, the principle of 'common but differentiated responsibilities' was initiated which to some extent favoured the developing nations as envisaged by many conventions and protocols. Obviously, the global North could not agree upon and hence the divide between North and South group of nations emerged.

- **New trade order post globalisation:**

Developing nations are lack of financial capital and other important resources which compel them to look forward to developed nations. Thus they are highly dependent on globalised world and under the threat of 'neo-colonialism'. Most of the Sothern states were under colonial rule when the North created the legal architecture for contemporary globalisation. World Bank, IMF, WTO and many more international institutions were created for free flow of natural resources, goods, services, capital across national borders and thus capturing the national sovereignty of those states. Due to their national developmental priorities, the southern nations have to abide by the rules and regulations set by these institutions and thus exploited by the Northern states. Most of the developing nations are primary exporter of their raw materials to the developed nations, thereby causing huge environmental damage to their own. Southern nations face huge trade barriers from the North as their bargaining strength is less in the world trade. This created non cooperative behaviour among the two groups as the South is facing larger environmental degradation due to these new trade orders. The debt crisis of 1980s compelled the southern nations to take various structural adjustment policies dictated by IMF and World Bank as

conditions of debt relief. It included privatisation, trade liberalisation, reduction or elimination of social safety nets, and expansion of export oriented production to service foreign trade. Thereby, debt ridden southern countries flooded the world market with minerals, timber and agricultural resources at cheaper prices and fulfilling the needs of developed countries.

One very important point to note that under provisions of WTO, developed nations in the name of environmental protection, impose ban on exports on various products exported by developing nations. We cite here the famous 'shrimp case' here. US imposed ban on import of shrimp from India on very controversial ground that if shrimps are caught in the vessels without turtle excluder device. The South group argue that Developed nations are imposing their 'values' on them in the name of protecting biodiversity, which is a form of 'eco-imperialism' and 'moral militancy'. The South group feel that developed countries have no right to do that as they have already done most of the environmental damage and these trade sanctions hamper their export earnings in the world market.

The developed countries are exporting their industrial waste to the poor southern countries where environmental regulations are not stringent. Instead of recycling or reprocessing them at home they prefer to dump it in those poor countries. This amounts to no co-operation among North and South. Though conventions like Basel imposed ban on such export of hazardous wastes; in the name of trade developed nations are exporting it to South, hampering their environment. India has become a major dumping ground of such toxic wastes.

- **Technological Front**

The southern countries are abundant in biodiversity and environmental resources while the Northern countries are equipped with Hi-fi technology and advanced bio-tech. The rise of patents and other intellectual property rights have immensely benefitted the North though they hardly possess the resources. Commercialisation of those genetic and other resources through patents and property rights by developed nations, have made the resources of the southern nations at stake. Apart from that the developing nations are deprived of bio tech advancements due to

restricted access created by patents and rights though they are affluent in bio resources.

Another fact is that the developing nations have been always deprived of technological advancement and they receive technologies already abandoned by the developed one. In other words, the developed nations dump their redundant technology in these poorer nations, thereby causing environmental damage and hazards. Though various conventions and protocols insisted transfer of green and clean technology to the developing nations, developed nations overlook it in the name of non-abiding clause. So the north south divide becomes stronger.



14.6 LETS US SUM UP

- Due to rapid economic growth, environment suffers a lot as economic growth and environmental degradation go hand in hand. During 1970s, when environmental problem spread across the globe, nations started to ponder seriously and global effort started through various conventions and protocols.
- Stockholm conference on human environment was the first to be held in seventies in a series of major UN conferences. It made an in depth study of the environmental problems and the dangers connected there with and also the need for doing something substantial with the cooperation of the nations of the world. The Stockholm conference created enthusiasm and hope to all the countries. In order to generate political will to sort out the issues, this conference created the United Nations Environment Programme (UNEP).
- The Montreal Protocol is an international treaty designed to protect the ozone layer from depletion by phasing out the production of numerous substances like Chlorofluorocarbons (CFCs) and other halogens.
- Kyoto Protocol is an international treaty under UNFCCC that commits state parties to reduce greenhouse gases (GHGs)

emission. The emission target includes all 6 major GHGs namely: (a) Carbon Dioxide (CO2), (b) Methane (CH4), (c) Nitrous Oxide (NO2), (d) Sulphur Hexafluoride (SF6), (e) Hydrofluorocarbons (HFCs) and (f) Perfluorocarbons (PFCs). This protocol developed three mechanisms to control emission namely: a) Clean development mechanism, b) Emission trading and c) Joint implementation.

- The Earth summit was one of the greatest endeavour of the world nations as from legal and institutional standpoint, the Earth Summit produced three important agreements. These were: (i) the Climate convention, (ii) the Biodiversity convention, and (iii) Agenda 21. In addition, the participants at UNCED agreed to a statement of principles known as the Rio Declaration. Each of these instruments established important precedents and underlined the continuing relationship between issues of economic development and environmental protection. Taken together, they set the agenda on global environmental issues for the next several decades.
- United Nations framework Convention on Climate Change (UNFCCC) is the most potential agreement to stabilize atmospheric concentrations of greenhouse gases at level that will prevent human activities from interfering dangerously with the global climate system.Many treaties and protocols are signed under UNFCCC.
- Agenda 21 was intended to be a set of guidelines on environment and development issues for states to follow in the twenty-first century: a sort of guiding principles of sustainable development. It has 40 chapters which are covered in 4 sections. The Agenda covers in great length and details about 'sustainable development' on the planet. It gives importance to poverty which has complex multidimensional aspects.Rio Declaration elaborately explains the role to be played by both developed and developing nations to achieve the goals as explained in Agenda 21. The Rio Declaration set the stage for international agreements which would respect the interest

of all and protect the integrity of the global environmental and development system.

- United Nations Conference on Sustainable Development, Rio+20decided to launch a process to develop a set of Sustainable Development Goals (SDGs) which will build upon the Millennium Development Goals and converge with the post 2015 development agenda. The Conference also adopted ground-breaking guidelines on green economy policies.
- Common but differentiated responsibility principle recognises differences in the contributions of developed and developing nations to global environmental problems on historical background, and also differences in their respective economic and technical capacity to tackle these problems. Though each nation is responsible for environmental problems, it is the developed countries which have contributed more to the problem. So, every State has 'common' responsibility of protecting the environment. Despite their common responsibilities, important differences exist between the stated responsibilities of developed and developing nations on historical ground and capabilities of nations.
- The principle of CBDR has two important consequences. Firstly, it entitles all concerned nations to participate in international response measures aimed at addressing environmental problems. Secondly, it helps nations to set environmental standards that accordingly impose differing obligations on nations.
- The global North and global South groups are generally distinguished in terms of levels of wealth, economic development, income inequality, and political and economic freedom as defined by freedom indices. Countries in the North group are wealthier, developed, and less unequal with more democratic values. They are hub of much advanced technological know-hows, who export technologically advanced manufactured products. On the other hand, Southern states are generally poorer developing countries burdened with poverty, unemployment, poor infrastructure. They are heavily

dependent on primary sector exports and most of them were under colonial rule by the Northern states.

- Non-cooperative behaviour or popularly known as the 'North-South divide' among the North and South group of countries started in the late 20th century and earlier part of 21st century. Causes of non-cooperative behaviour among these two groups on environmental issues can be drawn from historical legacy, developmental aspiration in economic and political front, social structure, technological divide, world trade regime, globalisation etc.



CHECK YOUR PROGRESS

Q 1: Write three important principles of Stockholm conference. (Answer in about 30 words)

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Q 2: What was the objective of Montreal Protocol? (Answer in about 20 words)

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Q 3: Write the full form of UNCED.

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Q 4: Write the full form of UNFCCC.

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Q 5: Write the objective of the Climate Convention. (Answer in about 50 words)

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Q 6: What was the focal theme of Agenda 21? (Answer in about 30 words)

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Q 7: What is the significance of Kyoto Protocol? (Answer in about 40 words)

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Q 8: Explain briefly the concept of common but differentiated responsibilities. (Answer in about 50 words)

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Q 9: What is 'common responsibility'? (Answer in about 40 words)

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Q 10: What is meant by 'differentiated responsibility'? (Answer in about 40 words)

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Q 11: What is meant by the term 'North-South divide'? (Answer in about 30 words)

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Q 12: Mention three important causes of non- cooperation among North and South regarding environmental issues. (Answer in about 20 words)

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Q 13: Explain briefly the historical ground of non -cooperation among North and South. (Answer in about 50 words)

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14.6 FURTHER READING

- Eugine, T. (2006). *Environmental Economics*: New Delhi, Vrinda Publications (P) Ltd.

- Stone, S.D. (2004). 'Common but Differentiated Responsibilities in International Law', *The American Journal of International Law*, Vol. 98, No. 2 (Apr., 2004), pp. 276-301.
- Mathur, A. (2009). 'Fractured Globalization: North South Divide over Human Rights and Environment', *The Indian Journal of Political Science,* Vol.70, No.1 (Jan. - Mar., 2009), pp. 9-20.

14.7 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: Three important principles are: 1. Natural resources must be safeguarded, 2. Non-renewable resources must be shared and not exhausted, 3. Pollution must not exceed the environment's capacity to clean itself.

Ans to Q No 2: To protect the ozone layer from depletion by phasing out the production of substances like Chlorofluorocarbons (CFCs) and other halogens.

Ans to Q No 3: United Nations Conference on Environment and Development

Ans to Q No 4: United Nations framework Convention on Climate Change

Ans to Q No 5: The objective of this agreement is to stabilize atmospheric concentrations of greenhouse gases at level that will prevent human activities from interfering dangerously with the global climate system. In ratifying the Convention, nations were expected to reduce emissions of the greenhouse gases to "earlier" (i.e. 1990) levels by the year 2000.

Ans to Q No 6: Agenda 21 set guidelines on environment and development issues for states to follow in the twenty-first century: a sort of guiding principles of sustainable development.

Ans to Q No 7: It is an international treaty under UNFCCC that commits state parties to reduce greenhouse gases (GHGs) emission.This protocol developed three mechanisms to control emission namely: a) Clean development mechanism, b) Emission trading and c) Joint implementation.

Ans to Q No 8: The principle recognises differences in the contributions of developed and developing nations to global environmental problems on historical background, and also differences in their responsibilities towards environment based on respective economic and technical capacity to tackle these problems.It held developed nations the most responsible for environmental degradation.

Ans to Q No 9: Common responsibility explains the shared responsibility of two or more nations towards the protection of a particular environmental resource. Common responsibility is applicable where the resource is shared, or under the sovereign control of a State.

Ans to Q No 10: Differentiated responsibility of developed and developing nations on environmental protection are based on factors like- historic contributions to the creation of an environmental problem, future economic development of countries, special needs and circumstances of the concerned nations.

Ans to Q No 11: The North and the South are distinguished in terms of levels of wealth, economic development, income inequality, and political and economic freedom as defined by freedom indices. North group are wealthier, developed, and less unequal with more democratic values but Southern states are poorer developing countries burdened with poverty, unemployment, poor infrastructure.

Ans to Q No 12: 1. Historical legacy, 2. New trade order post globalization, and 3. Technological front.

Ans to Q No 13: Historical legacy: Since developed countries exploited environmental resources much earlier than developing nations, the responsibilities should be more on them and burden should be divided on historical cumulative basis as demanded by developing nations instead of annual current basis as demanded by developed nations.



14.8 MODEL QUESTIONS

Short Questions (Answer each question in about 150 words)

Q.1: Write short notes on a) Kyoto Protocol, b) UNFCCC and c) Agenda 21.

Q.2: Discuss briefly on the followings:
a) Montreal Protocol, b) Basel Convention and
c) Vienna Convention.

Q.3: How the new trade order post globalization has created North South divide?

Long Questions (Answer each question in about 300-500 words)

Q.1: Explain the importance and outcomes of the 'Earth Summit' or United Nations Conference on Environment and Development.

Q.2: What is the principle of common but differentiated responsibilities? Explain the implications of the principle of common but differentiated responsibilities.

Q.3: Discuss the causes of non-cooperation among North and South on environmental issues.

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UNIT 15: GLOBAL INITIATIVE TOWARDS ENVIRONMENTAL ISSUES -II

UNIT STRUCTURE

15.1 Learning Objectives

15.2 Introduction

15.3 Global Environmental Issues

- 15.3.1 Climate Change Reflected in Global Warming and Ozone Depletion
- 15.3.2 Energy Crisis
- 15.3.3 Exploitation of Natural Resources
- 15.3.4 Pollution and Wastes Disposal
- 15.3.5 Biodiversity Loss
- 15.3.6 Sustainability of Development

15.4 International Trade and Environment

15.5 Let Us Sum Up

15.6 Further Reading

15.7 Answers to Check Your Progress

15.8 Model Questions

15.1 LEARNING OBJECTIVES

After going through this unit, you will be able to

- explain environmental issues of global concern
- differentiate between local/regional and global environmental problems
- establish the link between local and global environmental problems
- describe the sources of global warming and ozone depletion
- explain the natural resource taxonomy and the state and implication of energy crisis as global environmental crisis
- describe pollution and the nature of pollutants damaging the environment
- analyse the danger of loss of biodiversity

- discuss sustainable development as global environmental issue
- show the link between international trade and environment.

15.2 INTRODUCTION

It is needless to repeat that along with technological advancement the world has also witnessed considerable environmental damage. In pursuit of economic development and advancement of human well-being, the natural resources are being used in a manner that has led to over-exploitation of natural resources in one hand and accumulation of wastes or increase in level of pollution on the other hand, together leading to rapid depletion of the environment. As a result of human pursuance of economic progress, the stock of non-renewable natural resources is depleting fast and the rate at which the renewable natural resources are being used happens to be higher than the natural rate of replenishment. This presents a serious conflict between economic progress, production and consumption on the one hand and environment on the other. In a broader sense, environmental degradation is the continuous deterioration of natural resource base (energy and materials resources) over time resulting in many major life threatening situations like global warming, ozone layer depletion, loss of biodiversity, etc.

Environmental problem has two dimensions: local and global. In fact, there is two-way traffic of local environmental problem causing global effects and global trends causing local effects. There are clear instances in which poor natural resource management in some countries not only cause environmental damages in the countries themselves but also affects other countries and pose a threat to vulnerable ecosystem of the planet. For example, overgrazing and deforestation in many countries result in soil erosion, sedimentation, flooding and salinization, all of which affect the atmosphere and endanger wildlife in general. This is mainly due to the fact that many local environmental problems or negative environmental externalities have transitional nature. This aspect of environmental issues gained worldwide recognition since mid 1980s prior to which it was believed that environmental problems are predominantly of regional character and

restricted to individual countries. When the countries started acknowledging global dimensions of environmental problems the need for joint international effort to curb environmental problems has become a deliberate policy issue of the world as a whole. It is thus clear that global dimensions emanated from two major sources: (a) the mobility of adverse environmental qualities across borders of countries and (b) contribution of production, trade, trade policies in environment intensive goods, factors and services to environmental damages. In the next section, we shall discuss some of the global environmental issues keeping in mind the transnational nature of local pollutants of environmental problems.



LET US KNOW

Externalities take place when action of one economic agent affects another that is not directly involved in the activities of the former. It can be both positive and negative. While presence of positive externalities benefits others, the presence of negative externalities harms others.

Transnational externalities: Adverse or negative externalities crossing national boundaries are termed as transnational externalities. For example, (a) industrial wastes and agricultural run-off from West Bengal to river Churni or Ichhamati have presumably been killing fish and other aquatic lives in Bangladesh and affecting the water and mangrove forests of the Indo-Bangladesh watershed commons, (b) carbon dioxide emission from US thermal power plants have been observed to be crossing over to Canada along the regional air currents and have allegedly caused acid rain in Canada (Chakraborty, 2019).

15.3 GLOBAL ENVIRONMENTAL ISSUES

It is clear from the previous discussion that environmental problems have both local or regional and global dimensions and these are interlinked. The interlink between regional and global environmental issues is presented in the following flow chart.

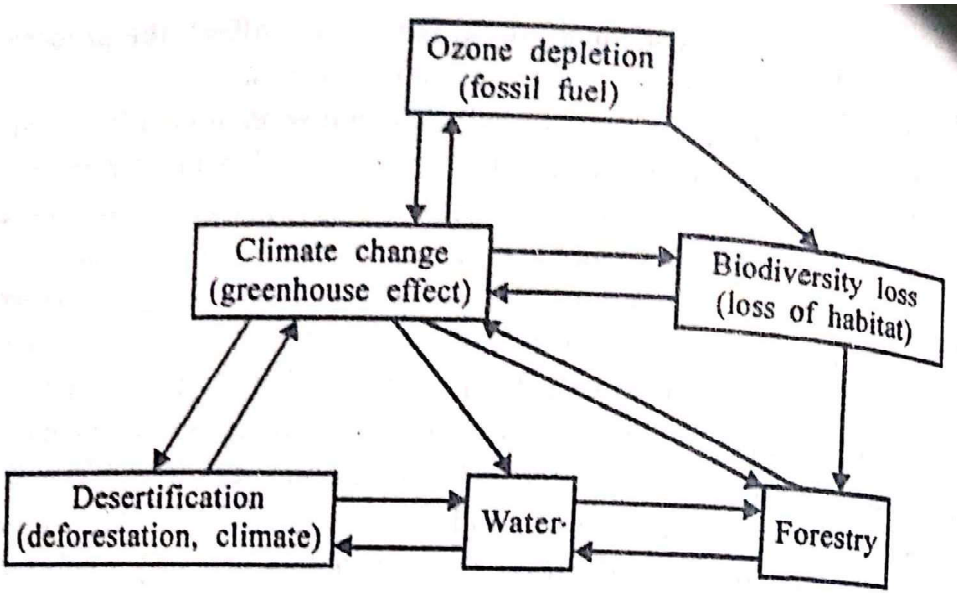


Figure 7.2 Linkages among Environmental Issues.

Source: World Bank (1997).

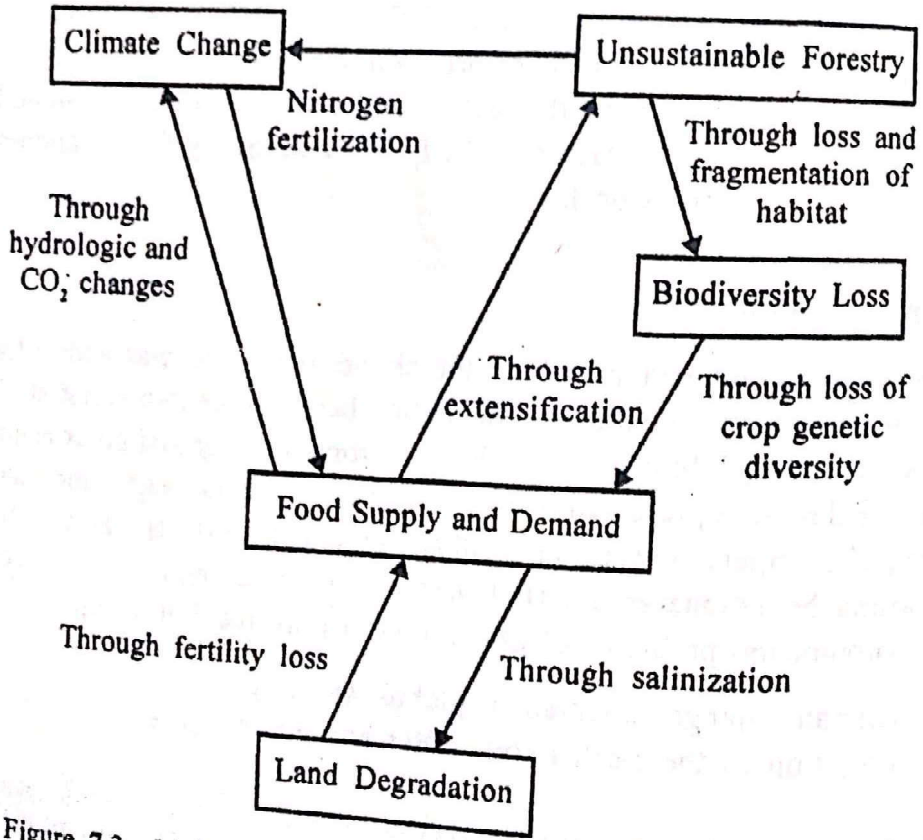


Figure 7.3 Linkages of Food Production (Threatened Sustainability).

Source: World Bank (1997).

Scanned with

Environmental problems of global concern refer to comprehensive environmental issues presently threatening our global environment. Air and water pollution do not recognise borders. Poor soil condition in one country may reduce another country's food supply. At the same time different regions face different problems. The environmental problems faced by developed countries are largely result of their economic strength and higher standard of living. Over-consumption is cited by many observers as a cause of resource depletion in the developed world resulting in adverse consequences for human population. Examples of environmental problems of global concern are as follows:

- Climate change as reflected in global warming and ozone depletion
- Energy crisis
- Pollution (that includes earth's soil, water and air)
- Overexploitation of renewable resources
- Depletion of exhaustible or non-renewable resources
- Loss of biodiversity
- Disposal of solid waste
- Sustainability of development

Let us discuss some of these issues in details for better understanding of the problems and enlarging our vision.

15.3.1 Climate Change Reflected in Global Warming and Ozone Depletion

Climate change is a clear ramification of environmental degradation. Climate is the long-term average of weather, typically averaged over a period of 30 years. Some of the meteorological variables that are commonly measured are temperature, humidity, atmospheric pressure, wind, and precipitation. Changes in the key elements in climate system clearly show changes over time posing some unavoidable threat to the mankind. Since all indicators of climate change cannot be covered here, let us discuss global warming and ozone layer depletion as indicators of climate change. Global warming is the persistence rise in surface

temperature of the earth and related changes in the geographical distribution and chemical quality of rainfall. It is the result of rising concentration and accumulation of green house gasses (GHGs). Major components of GHGs are carbon dioxide, methane, chlorofluorocarbons (CFCs), nitrous oxide, ozone and water vapour. The most recent assessment reports by the Intergovernmental Panel of Climate Change (IPCC) concluded that the global average surface temperature has increased by about 0.6 degree Celsius during the twentieth century. Additionally, in most mid and high latitudes of the Northern Hemisphere continents precipitation has increased by 0.5 to 1.0 percent per decade in the twentieth century. Emission of greenhouse gases, mainly carbon dioxide, continue to increase. The most recent estimate is that atmospheric concentration of the green house gases mainly carbon dioxide will get doubled or increase threefold pre-industrial levels by the end of this century. As a result, global surface temperature is expected to increase by 1.4 to 5.8 degree Celsius from 1999 to 2100.

The adverse effects of global warming are reflected in the decrease in forest biomass, decrease in agricultural production, damages caused by coastal inundation and sea water ingression due to rise in sea level. The present rise in temperature will lead to further rise in the sea level between 30 to 100 centimetres leading to acute aggravation of an already jeopardised common asset of the world that is our atmosphere and environment. This level of change in climate can create frequency and intensity of natural disasters from flooding to draughts to torrential rains, ice storms, tornadoes and hurricanes. Higher temperature, heavier rainfall and changes in climate would encourage vectors of some infectious diseases to multiply and expand to newer geographical regions. There are also numerous health effects both in terms of disease and injury associated with extreme weather events such as heat waves, storms and floods. This is interesting to note that these adverse effects will fall on almost all countries in the world equally.

Thus, it is easy to comprehend international dimension of global warming as a serious environmental issue.

Another related hazard to climate change is the destruction of ozone layer– a region of Earth's stratosphere that absorbs most of Sun's ultraviolet radiation. Ozone layer contains a very high concentration of ozone (O_3) in relation to other parts of the atmosphere. Over the years there is continuous depletion of ozone layers resulting mainly from manufactured chemicals such as halocarbon refrigerants, solvents, propellants and foam-blowing agents (chlorofluorocarbons (CFCs), HDFCs, halons) referred to as ozone-depleting substances (ODS). Ozone layer depletion and ozone hole have generated worldwide concern over increase in cancer risks and other numerous negative effects. Ozone layer contains less than 10 parts per million of ozone while the average ozone concentration in Earth's atmosphere as a whole is about 0.3 parts per million. Ozone layer is mainly found in the lower portion of the stratosphere from approximately 15 to 35 kilometres above Earth and its thickness varies seasonally and geographically.Ozone hole: There are two related events of ozone depletion which have been observed since the later 1970s. Ozone layer depletion is the steady lowering of about four percent in the total amount of ozone in Earth's atmosphere and Ozone hole is the much larger springtime decrease in the stratospheric ozone around Earth's polar regions. The health effects of climate change and ozone depletion is summarised in table 15.1 based on the World Development Report 1992.

Table: 15.1 The Heath Effects of climate chage and Ozone Depletion

Events	Potential direct effects	Potential indirect effects
Ozone depletion **UV radiation**	Skin cancer, cataracts (may be due to depression of immune system)	Impairment of photosynthesis leading to compromised food production (may exacerbate problems of groups with already compromised immune systems
Climate change		
Thermal stress	Death, illness, injury Habitat altercation: infectious diseases, epidemics Food production: malnutrition, Water quantity and quality: diarrheal diseases Aggravation of air pollution, aggravation of existing illness	
Storms	Drowning and injury	Loss of housing; Mental/physical stress of displaced persons
Floods	Same as storms	Same as storms Desertification, droughts; Malnutrition, stress
Brush/forest fires	Injury and death	Same as storms but to a lesser extent. Rise in sea level, susceptibility to storms, Water pollution, salt water intrusion Vector-borne diseases; Malnutrition, Social/demographic dislocations; Loss of infrastructure; Mental/physical stress of displaced persons.

15.3.2 Energy Crisis

When we identify global warming and ozone depletion as serious environmental problems with global concern, it is apparent to question the genesis of the problem. The genesis lies in the paramount increase in worldwide rise in energy demand requirement in the modern century. There has been unprecedented rise in

consumption of fossil fuels (coal, oil and natural gas) resulting in more emissions of carbon dioxide and fast depletion of exhaustible resources such as coal, hydrocarbons and natural gas in order to meet the rising demand for energy. Our life style and technology is entirely energy driven and we are dependent upon fossil fuels to meet our energy requirement. In technical term, this situation is described as carbon lock-in. This has led to energy crisis- a condition where the world's demand on the limited natural resources that are used to power industrial society are diminishing as the demand rises. It is a matter of deep concern in the sense that these natural resources have limited supply and while they do occur naturally, it can take hundreds of thousands of years to replenish the stores. A plethora of factors contribute to global energy crisis which include over consumption, overpopulation, unexplored renewable energy sources, wastages of energy, major accidents (like pipe line bursts), natural calamities, etc. What concerns us more is the fact that there is limited exploration of alternative energy sources. A few renewable energy sources have been identified but none of them have been promising enough when it comes to replacement of fossil fuels as the major source of energy for human being.

15.3.3 Exploitation of Natural Resources

Most of our human activities including agriculture, fishing, mining, etc. which have resulted in degradation of natural resources. While mining and extensive agriculture have resulted in large scale deforestation, over fishing has resulted in the reduction in population of marine creatures of the planet. If this exploitation tends to continue then crisis will prevail as these natural resources will get exhausted on which the mankind is dependent.

15.3.4 Pollution and Wastes Disposal

Pollution is environmental bads and the by-product of production and consumption activities. Along with the advancement

of human civilisation with more reliance on technology the level of pollution at all levels i.e. air, water and land is increasing so rapidly that it is matter of great concern for the mankind. Transport sector and combustion of fossil fuels results in generation of local pollutants such as sulphur dioxide, particulate matter, benzene, carbon monoxide, carbon dioxide which are responsible for air pollution. These are also significant net contributors to emission of greenhouse gases leading to global warming and ozone depletion (the ill effects of these are discussed in section 15.3.1). Recent estimates show that transportation such as cars, buses, trucks, railways, etc. account for nearly twenty-nine percent of GHG emissions in the world. The major advance countries like USA, European countries, UK and China together emit over fifty percent of the world's GHGs. Equally serious environmental issue that has global concern is the degradation of land resources. It is known that land is a unique resource for it is perfectly inelastic in supply (that is it is available to us in fixed quantity). So degradation of land resources (converting land for the construction of buildings and roads, soil erosion, desertification, deforestation) pose serious threats to mankind in terms of environmental costs such as reduction in landscape quality (for natural vegetation, forestation: the two main important ingredient of human survival on earth), loss of wildlife habitat (threat to biodiversity), islanding effects whereby movements of corridors for wildlife are disrupted (example is the increased man-animal conflict in many parts of the country) and loss of cultural heritages sites. Similar to air and land, the most serious environmental issue having global concern is the water pollution. The level of water pollution is so high that there is apprehension that the whole world will suffer from pure drinking water crisis. Regarding water pollution main concern is the non-point pollution where emissions are very hard to measure as they are not traceable to single point of entry like point source pollution. Point source pollution is defined as an emission which enters water bodies from an easy to identify single source

such as pipe from a factory or the outfall from a sewage works. The serious concern regarding water pollution is due to the unavoidable sources from where it originates, for example,

- Industry in the form of point source discharges of heavy metals, organic wastes and other pollutants;
- Municipal sewage treatment works or direct sewage outfalls
- As acidic drainage water from old mines
- As leachate from landfill sits
- As pathogens washing off from fields in which cattle are kept
- As run-off of oils and solvents from city streets and
- As run-off of fertilizers, pesticides and soil erosion from farmland and forests.

The increasing reliance on groundwater for domestic, agricultural and industrial purposes pose another challenge to the mankind worldwide leading to acute water crisis.

15.3.5: Biodiversity Loss

Biodiversity or diversity in biological life forms is a crucial life support system for human life on the earth. Biodiversity is the variety and variability of life on Earth. It is a measure of variation at the genetic, species and ecosystem level. Biodiversity include three types: diversity within species (genetic diversity), between species (species diversity) and between ecosystems (ecosystem diversity) As UNEP, 1993 defines, biodiversity is the variability among living organisms from all sources, including inter alia, terrestrial, marine and other aquatic ecosystem and the ecological complexes of which there are a part: this includes diversity within species between species and of ecosystems. However, due to environmental damage that includes loss of forest cover, more and more use of land for agriculture and other use there is loss of habitats that support biodiversity. As result of which many species on Earth are endangered and facing extinction or near to extinction. The increased loss of biodiversity and consequent loss of a species is a cause of

concern for the mankind at least for three reasons: (a) the species lost may have a direct value in terms of genetic material for food crops or as a source of medicines, (b) a species may play a critical role in maintaining ecosystem and providing humanity with a range of ecosystem services such nutrient cycling and water catchment regulation, and (c) a species may have aesthetic and non-use benefits for instance people like to see charismatic species such as birds and butterflies in the wild (Hanely et al. 2004). It is important to note here that there exists a food web relationship among species that qualifies the maintenance of ecosystem so that reduction in any one may become fatal for an entire ecosystem. Similarly, the changes in air quality or quality of water or wetlands through chemical changes in the environment species become endangered and vulnerable, thus in turn threatening the biodiversity on the planet. This way environmental damage becomes a serious threat to habitats and biodiversity.

At the global level, accumulated depletion of natural resources and habitats over time has resulted in threatening the biodiversity. Deforestation, pollution, climate change, ocean warming, desertification, loss of wetlands to human settlement have been contributing to destruction of biodiversity and near collapse. Overhunting, overgrazing, over population (under population in case of endangered species) have been causes of global concern because of their threat to the total web of life system on the planet (Chakraborty, 2019).

15.3.6 Sustainability of Development

We have discussed above that the resources on the earth are finite and they are depleting fast. This has posed a big question on the sustainability of present state of development in near future. Immediately after the publication of the Brundtland Committee Report (WCED 1987), sustainable development has become one of the widely discussed global environmental concern. According to the Brundtland report, “sustainable development is the development that

meets the needs of the present generation without comprising the ability of the future generation to meet their own needs". In a simplified term sustainable development requires natural capital to remain intact over the generation. But it raises concern because the present state of indiscriminate use of natural resources and consequent stress on the environment due to large scale eco-harmful economics activities of mankind has little ability to retain natural capital intact in future.



CHECK YOUR PROGRESS

Q.1: What is meant by environmental goods and services?

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_ _

Q.2: What is environmental bad?

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_ _

Q.3: There is a two-way traffic between local and global environmental problems. True/False

Q.4: What is externality? Give an example of negative externality.

_ _

_ _

Q.5: Pollution is a negative externality. True/False.

Q.6: State the difference between point and non-point pollution?

_ _

_ _

Q.7: What is global warming?

_ _

_ _

Q.8: State two implications of land degradation.

_ _

_ _

Q. 9: What is biodiversity?

_ _

_ _

Q.10: What is sustainable development?

_ _

_ _

Q.11: What is natural replenishment rate of any renewable resources?

_ _

_ _

15.4 INTERNATIONAL TRADE AND ENVIRONMENT

The discussion on global environmental issues is not complete without discussing the link between international trade and environment in details. The relationship between international trade and the environment has been a matter of serious deliberation in the field of Economics or Environmental Economics in the recent years. Economists are primarily interested in exploring how environmental factors/resources influence the gains from international trade, while environmentalists are primarily concerned about how the expansion in international trade impacts global environmental conditions. To be very specific, there are two-way linkages between international trade and the environment and in the recent years the former is treated as one of the responsible factors for many environmental ills/damages. As international trade is related to a country's trade, it has an inextricable linkage with the environment. The link between trade and environment protection, consisting of both the impact of environmental policies on trade, as well as the impact of trade on the environment, was recognised as early as 1970. In the early 1970s, there was growing international concern regarding the impact of economic growth on social development and the environment. Trade and environment emerged as an issue of academic and public concern in the 1980s and gained prominence in national policy making and international conferences since the 1990s, in

particular since the 1992 Rio Earth Summit. Since then, more attention has been given to the role of trade and trade policies in promoting or hindering moves to protect our natural environment.

International trade facilitates exchange of goods and services across borders of countries. International trade largely changes production and consumption pattern of a country involved in trade and this change in the spatial distribution of production and consumption affects the environment nationally and globally.

In international trade, transactions are facilitated by international financial payments, in which the private banking system and the central banks of the trading nations play important roles. Free international trade has various positive effects on countries. In the eighteenth century in France, Physiocrats demanded liberty of production and trade. In England, the economist Adam Smith demonstrated the advantages of removing trade restrictions in his book *"The Wealth of Nations"* This doctrine of free trade was also advocated by economist David Ricardo (1817) and the followers of comparative advantage principles of trade have largely believed that countries benefit by an increase in welfare from free trade and hence trade restrictions through tariffs and quotas must be reduced to expand gains from international trade. These principles have also been pursued through the General Agreement on Tariffs and Trade (GATT) and World Trade Organisation (WTO) which succeeded GATT in 1995. As a result of this, the world has witnessed a considerable expansion in trade volume of a country engaged in international transactions and the global production and consumption has increased manifold.

International trade drives changes in national patterns of production of goods and services, which in turn entails impact on the domestic environment. This impact is further influenced by domestic environmental regulations. As an engine of growth, trade can also provide the necessary resources for environmental conservation. Further, trade may lead to a reallocation of production to countries which are better able to deal with the environmental side-effects of production. Conversely, the environment and environmental concerns impact trade. The natural environment is the basis of production for many exported products, particularly from developing

countries, and an important input to their long-term sustainable development. Growing environmental concerns as enshrined in the international level in multilateral environmental agreements (MEC) and at the national and local level in environmental regulations and standards, as well as consumer preferences for "greener" products, increasingly influence trade patterns.

International trade has both positive and negative effects on the environment which makes it one of the key issues of a country. It has a direct impact on the environment by increasing pollution or degrading natural resources. Trade also makes possible the over exploitation of species to the point of extinction. A major concern is that the increasing competition between companies induced by further trade liberalisations causes a "race to bottom" in environmental standards, because countries might weaken their environmental policy in order to shelter their industry from international competition. Increased pollution haven in some developing countries as a result of trade liberalisation lured by employment and income generation is another adverse consequence of international trade.

However, increased trade can in turn, by supporting economic growth, development and social welfare, contribute to a greater capacity to manage the environment more effectively. More importantly, open markets can improve access to new technologies that make local production processes more efficient by diminishing the use of inputs such as energy, water and other environmentally harmful substances. Similarly, trade and investment liberalisation can provide firms with incentives to adopt more stringent environmental standards. As a country becomes more integrated within the world economy, its export sector becomes more exposed to environmental requirements imposed by the leading importers. Changes needed to meet these requirements, in turn flow backwards along the supply chain, stimulating the use of cleaner production processes and technologies. Similarly, the increased income due to international trade may lead to consumers demanding higher environmental standards as delineated by the Environmental Kuznets Curve (EKC). However, there is little empirical evidence of this pro-environment effect of international trade when a country adopts stringent environmental regulations. Tobey (1990) in a multi-country

cross section study taking into consideration five pollution-intensive industries viz. mining, paper, chemicals, steel and non-ferrous metals, has concluded that stringent environmental control measures caused export pattern deviate from patterns predicted by the resource endowments of the countries. Akin to other studies, this study concludes that pollution abatement costs are a relatively small proportion of the total costs of production.

Hence to keep a balance between the positive and negative impacts of trade on the environment, effective environmental policies and institutional frameworks are needed at the local, regional, national and international levels. Countries have undertaken a number of environment related efforts under the World Trade Organisation (WTO) framework including negotiating tariff reductions in environmental goods and services, seeking more clarity on the relationship between existing WTO rules and specific trade obligations in multilateral environmental agreements. WTO which has an important role to play in the field of trade and environment mainly focused on sustainable development. Its members recognised that the WTO is not an environmental protection agency and that it does not aspire to become one. Its competence in the field of trade and environment is limited to trade policies and to the trade related aspects of environmental policies, which have a significant effect on trade. In addressing the link between trade and environment, WTO members do not operate on the assumption that the WTO itself has the answer to environmental problems. However, they believe that trade and environmental policies can complement each other. Environmental protection preserves the natural resource base on which economic growth is premised, and trade liberalisation leads to the economic growth needed for adequate environment protection. To address this, the role of WTO is to continue to liberalise trade, as well as to ensure that environmental policies do not act as obstacles to trade, and that trade rules do not stand in the way of adequate domestic environmental protection.



15.5 LET US SUM UP

- Environmental problem has two dimensions: local and global. In fact, there is two-way traffic of local environmental problem causing global effects and global trends causing local effects. Poor natural resource management in some countries threatens the physical basis of the countries themselves and harms the fragile ecosystem of the planet.
- Some of the environmental problems of global concern are climate change as reflected in global warming and ozone depletion, energy crisis, pollution (that includes earth's soil, water and air), overexploitation of renewable resources, depletion of exhaustible or non-renewable resources, loss of biodiversity, disposal of solid waste and sustainability of development.
- Climate change is one of the major global concerns of environmental problems getting reflected in global warming and ozone depletion. Global warming is the persistence rise in surface temperature of the earth and related changes in the geographical distribution and chemical quality of rainfall. It is the result of rising concentration and accumulation of greenhouse gasses (GHGs). Major components of GHGs are carbon dioxide, methane, chlorofluorocarbons (CFCs), nitrous oxide, ozone and water vapour. The most recent assessment report by the Intergovernmental Panel of Climate Change (IPCC) concludes that the global average surface temperature has increased by about 0.6 degree Celsius during the twentieth century.
- Death, illness, injury, habitat altercation: infectious diseases, epidemics; food production: malnutrition; water quantity and quality: diarrheal diseases; aggravation of air pollution; aggravation of existing illness are some of the serious effects of climate change.
- The damages caused to the environment, which is by and large used as the dump for wastes of economic activities, in the form of

pollution of air and water and destruction of plants and biological species are significant costs to the society.

- At the global level, accumulated depletion of natural resources and habitats over time has resulted in threat to biodiversity. Deforestation, pollution, climate change, ocean warming, desertification, loss of wetlands to human settlement have been contributing to destruction of biodiversity and near collapse. Overhunting, overgrazing, over population (under population in case of endangered species) have been causes of global concern because of their threat to the total web of life system on the planet.
- International trade has both positive and negative effects on the environment. It has a direct impact on the environment by increasing pollution or degrading natural resources. Trade also makes possible the over exploitation of species to the point of extinction. A major concern is that the increasing competition between companies induced by further trade liberalisations causes a "race to bottom" in environmental standards, because countries might weaken their environmental policy in order to shelter their industry from international competition.



15.6 FURTHER READING

Chakraborty, P. (2019), "Global Environmental Issues and Initiatives", in R. N. Bhattacharya (2019) ed., *Environmental Economics: An Indian Perspectivs,* Oxford University Press, New Delhi.

Nick Hanely, J. F. Shogren and B. White (2004), *Introduction to Environmental Economics,* Oxford University Press, New York

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15.7 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: Environmental goods are subcategory of public goods which include clean air, landscape, green transport infrastructure, flora and fauna, etc. and environmental service is nature's capacity to provide quality life and comfort i.e. to ensure that life as exists in quality form. Example- pure air, fertile soils, forest rich in biodiversity, nutritious and abundant foods and so on.

Ans to Q No 2: Bads in general refers to those things consumption of which decreases our utility/or adds to disutility. Environmental bads refers a broad category of events or things which endanger or affect the natural environment or environmental ecosystem.

Ans to Q No 3: True

Ans to Q No 4: An externality is defined as an action by one individual agent that provides benefits or costs affecting other individual agents. Externality is negative when action has negative effects on the agents. Examples: 1. If neighbour plays loud music at 4 a.m. in the morning, 2. Riding on a noisy motor cycle, 3. Smoking in a public place. Pollution is a very good example of negative externality.

Ans to Q No 5: *True.*

Ans to Q No 6: According to United States Environmental Protection Agency (EPA), point source pollution is any contaminant that enters the environment from an easily identified and confined place. Example include discharge pipe of an industrial plant, drainage ditches. Nonpoint-source pollution is the opposite of point source pollution with pollutant released in a wide area hence the source cannot be identified. For example, run off i.e. rain water which flows and washed away drops of oil that leaked from car engines, particles of the rubber, wastes, trash, etc.

Ans to Q No 7: The rise in mean or average surface temperature of earth due to the effect of greenhouse gases such as carbon dioxide emission from burning fossil fuels (oil, coal and natural gases) or from deforestation which trap heat which would otherwise escape from the earth is a type of greenhouse effect.

Ans to Q No 8: First reduction in landscape quality (for natural vegetation, forestation: the two main important ingredient of human survival on earth) and secondly, loss of wildlife habitat (threat to biodiversity), islanding effects whereby movements of corridors for wildlife are disrupted (example is the increased man-animal conflict in many parts of the country)

Ans to Q No 9: Biodiversity is the variety and variability of life on Earth. It is a measure of variation at the genetic, species and ecosystem level. Biodiversity include three types: diversity within species (genetic diversity), between species (species diversity) and between ecosystems (ecosystem diversity)

Ans to Q No 10: According to Brundtland Commission Report "Sustainable development is the development that meets the needs of the present without compromising the ability of the future generations to meet their own needs". This is the most widely accepted comprehensive definition of sustainable development.

Ans to Q No 11: The natural replenishment rate of any renewable resources is that it is the rate at which all natural resources can regenerate themselves. If natural rate replenishment is lower that the extraction rate then degeneration of environmental resources takes place. The magnitude of environmental resources gets degenerated.



15.8 MODEL QUESTIONS

A. Very short questions:

Q.1: What is environment?

Q.2: What is local environmental problem?

Q.3: What is global warming?

Q.4: What is ozone layer depletion?

Q.5: State the pollutants that deplete the ozone layer.

Q.6: What is the main source of energy demand?

Q.7: Pollution is environmental bad. True/False

Q.8: What is the difference between point and non-point pollution sources?

Q.9: Define biodiversity.

Q.10: Give a suitable definition of sustainable development.

Q.11: What is autkary?

Q.12: How does free trade help in environmental conservation?

Q.13: What is pollution haven?

Q.14: Expand, WTO, GATT, UNDP, UNEP

B. Short Questions:

Q.1: Describe the link between local and global environmental problems.

Q.2: Explain two serious implications of global warming.

Q.3: State three adverse effects of ozone layer depletion.

Q.4: Explain the mismatch between energy demand and available energy sources.

Q.5: What is carbon lock in? Suggest two ways to do away with carbon lock in.

Q.6: Identify five sources of water pollution.

Q.7: State three adverse implications of land degradation that has global concerns.

Q.8: What is biodiversity? How does it lead to environmental damages?

Q.9: Is the present state of development sustainable? Give arguments in support of your answer.

Q.10: Discuss the beneficial effects of international trade on the environment.

Q.11: Discuss in brief the adverse effects of international trade on the environment.

Q.12: State the link between trade liberalisation and pollution haven.

C. Long Questions:

Q.1: Discuss in detail the inter-linkage between environmental problems which has global environmental implications.

Q.2: What is global warming? What are the sources of global warming? Discuss the effects of global warming on the environment and mankind in details.

Q.3: What is pollution? Discuss the sources of air, land and water pollution.

Q.4: What is biodiversity? How does loss of biodiversity impose threat to the mankind? Explain.

Q.5: Discuss environmental problems which have global concerns.

Q.6: Explain the link between international trade and environment.

Q.7: Does international trade lead to environmental damage? Suggest policies to address the threat caused by international trade to global environment.

Q.8: Discuss the role of international trade in environmental conservation of a country.

*** ***** ***



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Name of the Paper: Course Code:

Centre for Internal Quality Assurance (CIQA)
Krishna Kanta Handiqui State Open University
City Office, Housefed Complex, Guwahati- 06

Learner's Feedback on Course

Dear Learner,

Regarding the course as mentioned above, we would like to know your opinions and comments so as to improve the quality of self learning materials in future. Please respond to the following statements by ticking the number you feel most reflect your opinion. After completion of the additional comments, please detach the page and send/mail the same to us at the address given below.

The Director, Centre for Internal Quality Assurance, KKHandiqui State Open University
Housefed Complex, Dispur, Guwahati- 781006
(E-mail id: ciqa@kkhsou.in)

1. Approximately how many hours did you spend for studying the units in the course? | | | |
2. Please give your opinions (by √ mark) to the following items based on your reading of the block:

Sl. No.	Statements	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
I.	The SLMs of the course fulfil the learning objectives set out in the beginning of each unit					
II.	The units of the SLM could satisfy my academic needs and expectations					
III.	The Unit writers have excellent knowledge about the course contents					
IV.	Language and contents of the units were presented at a level which I could readily understand					
V.	Ample opportunity for participation in the activities provided in the units					
VI.	Used enough Illustrations (Diagrams, tables etc.) for conceptual clarity					
VII.	Quality of content is engaging, relevant, and up-to-date					
VIII.	The self check questions are very helpful					
IX.	The Possible/model questions and the answers to check my progress have benefited me a lot					

Additional Comments: *(Please feel free to provide your open comments)*

1. Which aspects of the SLM, according to you, worked well?

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2. What sort of changes/improvements do you feel KKHSOU could implement to improve the overall quality of the SLM?

Thank you for taking the time to complete this form.

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