EXTERNALITIES

1. Unit-III Sem. II (C.U)

(A) What is Externalities

Externalities are pervasive and significant phenomena in-the modern world. For example, external benefits from education, children gain from educated parents, society benefits as education reduces crime, social unrest and unemployment and welfare costs, society benefits from an educational system that inculcates acceptable social values, improves communication, and strengthens democratic institutions etc. On the external cost side are the many forms of pollution and other disamenities. Therefore, the term externalities means the economic effects which occur from the production or the use of goods to other parties or economic units. Externalities can arise between producers, between consumers and producers. Externalities can **be negative-when the action of one party imposes cost an another party-or positive-when the action of one party benefits another party.**

A negative Externality occurs, for example, when a steel plant dumps its waste in a river that fishermen downstream depend on for their daily catch.The more waste the steel plant dumps in the river, the fewer fish it will support. On the other hand the negative Externality arises because the steel firm has no incentive to account for the external costs that it imposes on fishermen when making its production decision. While positive externality would occur when a homeowner repaints his house and plants an attractive garden. All the neighbours benefit from this activity, yet the decision to repaint and landscape probably did not take these benefits for the neighbours into account. Thus the benefits are a positive externality.

NEGATIVE EXTERNALITIES AND INEFFICIENCY

As externalities are not reflected in market prices, they can be a source of economic inefficiency. Let us take a example of a steel plant dumping waste into a river. Figure 6(*a*) shows the production decision o

the steel plant in a competitive market, and part 6(*b*) shows the market demand and supply curves, assuming that all steel plants generate similar externalities. Let us assume that the firm has a fixed proportions production function. It cannot alter its input combinations; effluent can be reduced only by lowering output. We will analyse the nature of the externality in two steps; **first** when only one steel plant pollutes, and the **other** when all steel plants pollute in the same way.

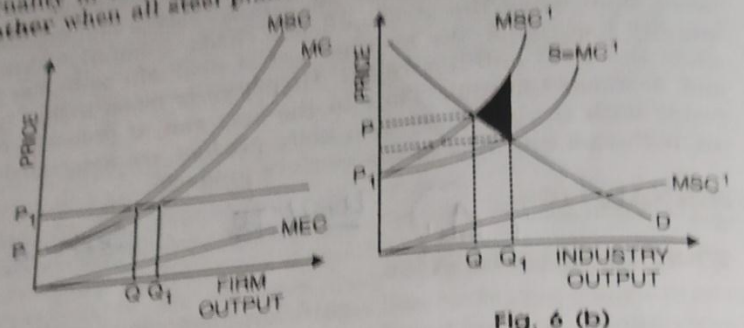

Fig. 6 (a) Fig. 6 (b)

The price of steel is P_1, at the intersection of the demand and supply curves in Figure 6*b*. The MC curve in part (*a*) gives a typical steel firms marginal cost of production. The firm maximizes profit by producing output at which marginal cost is equal to price (which equals marginal revenue, because the firm takes price as given). As the firms output changes, the external cost imposed on fishermen downstream also changes. This external cost is given by the marginal external cost (MEC) curve in Figure (6*a*). The curve is upward sloping for most forms of pollution because as the firm produces additional output and dumps additional effluent in the river, the incremental harm to the fish industry increases.

From a social point of view, the firm produces too much output. The efficient output is the level at which the price of the product is **equal to the marginal social cost of production.** This marginal social cost is the marginal cost of production plus the marginal external cost of dumping effluent. In Figure 6(*a*) the marginal social cost curve is obtained by adding marginal cost and marginal external cost for each level of output (*i.e.* MSC = MC + MEC). The marginal social cost curve MSC intersects the price line at the output. Because only one plant is dumping effluent into the river in this case, the market price of the product is unchanged. However, the firm is producing too much output (Q_1 instead to Q) and generating too much effluent.

Now consider what happens when all steel plants dump their effluent into rivers. In Figure 6(*b*), the MC^1 curve is the industry supply curve. The marginal external cost associated with the industry output MEC^1, is obtained by summing the marginal cost of every person harmed at each level of output. The MSC curve represents the sum of the marginal

cost of production and the marginal external cost for all steel firms. As a result, $MSC^1 = MC^1 + MEC^1$.

Now, question arises whether the industrial output is efficient when there are externalities ? As Figure 6 (*b*) shows, the efficient industry output level is the one at which the marginal benefit of an additional unit of output is equal to the marginal social cost. Because the demand curve measures the marginal benefit to consumers, the efficient output is given at Q, at the intersection of the marginal social cost MSC^1 and demand D curve. The competitive industry output, therefore, is at Q_1, the intersection of the demand curve and the supply curve, MC^1. Thus industry output is too high.

In example, each unit of output results in some effluent being dumped. Therefore, whether we are looking at one firm's pollution or the entire industry's, the economic efficiency is the excess production that causes too much effluent to be dumped in the river. But the source of the inefficiency is the incorrect pricing of the product. The market price P_1 in Figure 6 (*b*) is too low as it reflects the firms marginal private cost of production, but not the marginal social cost. Only at the higher price P will steel firms produce the efficient level of output.

What is the cost to society of this inefficiency ? For any output greater than Q, the social cost is given by the difference between the social marginal cost and the marginal benefit (which is given by the demand curve). As a result, the aggregte social cost can be determined by summing the difference between MSC^1 and D for all units of production that exceed the efficient level. In Figure this social cost is shown as the shaded area that represents the difference between MSC and the D curve, measured from outpt level Q to output Q_1.

In short, externalities generate long-run as well as short-run inefficiencies. The firms enter a competitive industry whenever the pice of the product is above the average cost of production, and exit whenever price is below average cost. In long-run equilibrium, price is equal to (long-run) average cost. When there are negative externalities, the average private cost of production is less than the average social cost. Consequently, some firms remain in the industry even when it would be efficient for them to leave. Thus, negative externalities encourage too many firms to remain in the industry.

POSITIVE EXTERNALITIES AND INEFFICIENCY

Externalities can also result in too little production, as the example of a homeowner repairing and landscaping her house shows. In Figure 7 the horizontal axis measures the homeowner's investment (in rupees) per month on landscaping. The marginal cost curve for home repair shows the cost of repairs as more work is done on the house; it is horizontal

because this cost is unaffected by the amount of repairs that any one person undertakes. The demand curve D measures the marginal private benefit of the repairs to the homeowner. The homeowner will choose to invest Q_1 in repairs, at he intersection of her demand and marginal cost curves. But repairs generate external benefits to the neighbours as the marginal external benefit curve, MEB, shows. This curve is downward/sloping in this figure because the marginal benefit is large for a small amount of repair but falls as the repair work becomes extensive.

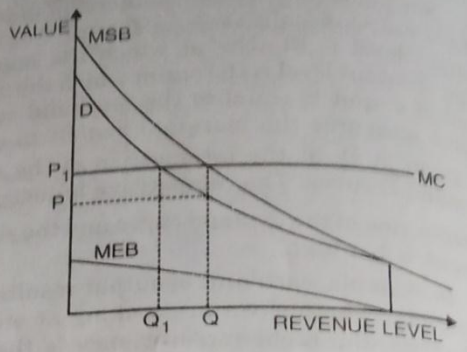

Fig. 7

The marginal social benefit curve MSB is calculated by adding the marginal private benefit and the marginal external benefit at every level of output. In short, MSB = D + MEB. The efficient level of output Q is the level of output at which the marginal social benefit of additional repairs is equal to the marginal cost of those repairs. This is found at the intersection of the MSB and MC curves. The inefficiency arises because the homeowner does not capture all the benefits of her investment in repairs and landscaping. As a result, the price P_1 is too high to encourage her to invest in the socially desirable level of house repair. A lower price P is required to encourage the efficient level of supply. Therefore, a lower price P is required to encourage the efficient level of supply. As Figure 7 shows, at P the homeowner will choose the level of repairs given by Q.

EXTERNALITIES AND MARKET FAILURE

After considering negative and positive externalities and its relationship with inefficiency, let us see **how externalities affect the efficiency or market allocation**. For this purpose, a case is taken in which the production of commodity, say iron, generates air pollution that adversely affects the welfare of the people in the surrounding community. The cost of iron thus has two components

(i) the cost of the labour, machines, iron ore, coal, and other inputs directly required to produce the iron; and

(ii) the costs borne by members of the community in the form of air pollution damages.

In Figure 8 the marginal cost (MC) schedule shows how the first category of costs varies as the output of iron varies. The social marginal cost (SMC) schedule shows the additional costs, both direct and air

pollution costs, associated with additional units of output. The vertical difference between the two schedules represents the pollution damages associated with each unit of iron production. Pollution damages are defined as the amounts that all persons affected by the pollution would pay to eliminate the pollution. Thus, the shaded area of figure represents the amount that those damaged by pollution would pay to have pollution reduced from the level associated with iron output of Q to the lower pollution level associated with Q.

The market demand schedule for iron is D. Given these demand and cost schedules, firms will produce Q^1 units to be sold at price P^1, if (1) markets are competitive, (2) pollution is legal firms do not have to compensate any one damaged by their air pollution and (3) those damaged by pollution do not bribe firms to produce less. Considering these assumptions, the competitive market equilibrium price and quantity are P^1 and Q^1, respectively.

Although an output of Q^1 is the competitive market equilibrium, this is a potential welfare gain for all persons to be obtained by reducing output. Here we must know that the air pollution cost associated with the Q^1 unit of output is the distance ***ef***. Those damaged by pollution would be better off if they were to pay any amount less than ***ef*** to producers to induce them not to produce the Q^1 unit. Any such payment would also make the producers better off since they earn zero profit on the Q^1 unit. Therefore thre is potential welfare gain for all parties of if the Q^1 unit is not produced. Similarly, for all units in the range Q to Q^1, the pollution damages per unit exceed producer and consumer surplus per unit; those who are damaged by pollution would gain enough from reducing the output to more than compensate the producers and consumers of iron for the reduced output. If output is reduced from Q^1 to Q, pollution damages fall by the amount represented by the area $a + b + c + d$. Producer and consumer surplus fall by areas a and b, respectively. The potential net welfare gain is thus the area $c + d$. Reducing output below Q can not increase the welfare of all persons (both those damaged by pollution and the producers and consumers of iron) because the reduction in pollution damages is less than the fall in producer and consumer surplus. That, is although iron [illegible] external costs when output is limited to Q, such

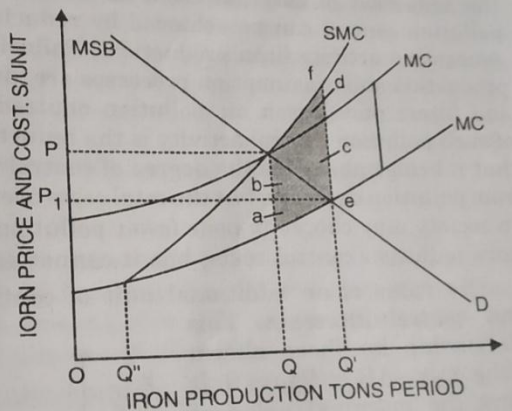

Fig. 8

external costs are not Pareto relevant because their elimination must make someone worse off.

Besides, markets may also fail to achieve efficient allocation when external benefits are associated with a production or consumption activity. But in the case of external benefits, the tendency is for the scale of the externality generating activity to be too small.

EFFICIENT ADJUSTMENT FOR EXTERNALITIES

Markets will fail to achieve allocative efficiency when there are externalities. At the same time, another conclusion can be drawn that externalities justify government intervention in allocation decisions if efficiency is sought. But such is not always the case. Although external costs and benefits may arise in a variety of ways. Here, we will only focus on air and water pollution as specific examples of external costs. The analysis for other externalities would essentially be the same.

It will be helpful if we think of pollution control or, more generally, the reduction of external costs as an activity. In the iron production pollution control can be achieved by reducing the scale of the pollution generating activity (iron production). Pollution control may also occur as production and consumption processes are altered, for example, scrubbers and filters may lessen air pollution omitted by an iron mill. The value of such pollution control activity is the reduction in the pollution damages that it brings about. As the degree of control increases, the total damages from pollution decrease, but the total costs of controlling pollution increase. So society may choose to bear fewer pollution costs (damages) by bearing more pollution control costs, but it cannot escape both costs.

The value of an additional unit of control is likely to diminish as total control increases. This relationship has been shown by the curve **AB** in figure 9. It shows the marginal value of air pollution control the dollar amounts that all of the members of a community are willing to pay for incremental reductions in pollution (marginal increases in air quality). Alternatively, from right to left, **AB** shows the marginal cost of pollution the minimum incremental loss (damage) that the comunity incurs as a result of increases in pollution. For the iron pro[illegible]tion the vertical distance between the MC and SMC curves, which ranges from zero at iron output of Q^{11} to *ef* at iron output of Q^{1}, represents

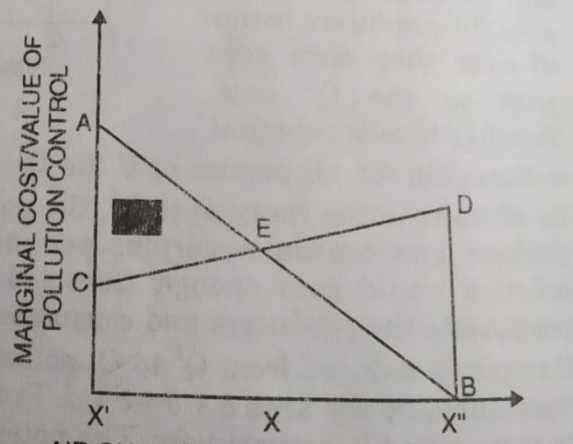

Fig. 9

these pollution damages (see figure 8). The curve CD shows the marginal cost of reducing pollution when the least-cost means of controlling pollution are used. This marginal cost is the value of the goods and services given up for incremental increases in pollution control the value of output sacrificed by producing more pollution control devices for producing less of the pollution causing output or both. The marginal cost of control increases as the amount of control increases because it becomes increasingly difficult to reduce pollution as the amount of pollutants in the air diminishes. In the figure 9, from left to right on horizontal axis indicates that air pollution damages are decreasing and air quality is increasing because more goods and services are being sacrificed to reduce pollution. Thus there two curves assumed to be (1) unaffected by the distribution of the gains from and costs of pollution control and (2) stable over time.

The amount of control provided to the community if people each act independently to maximize their own gain from pollution control is x^1. A control level of x^1 does not mean that no measures are being taken to limit pollution. Instead, as x^1 no individual is willing to pay the full cost of increasing pollution control by an additional unit.

To conclude the discussion, we can say that for efficient pollution can role depends on the CCA and the laws that specify the rights of each person to use resources such as air and water.

GOVERNMENT MECHANISM OF ADJUSTING FOR EXTERNALITIES

Keeping in view the various externalities, it becomes desirable to control the same at the earliest possible. The Government takes many steps to control and adjust externalities like taxes, regulations and subsidies. However, these factors are discussed below :

(*i*) **Definition and Enforcement of Property Rights.** An externalities do not result in inefficiency if property rights are defined and CCA are sufficiently low. Thus government way, in some cases, prevent inefficiency by clearly defining and enforcing property rights. For example, suppose a small lake has been used for fishing, swimming, and waste disposal by persons and businesses located on the surrounding land. When the area is scatterly populated, its use was not competitive. But population and economic activity have increased to the extent that the waste disposal would soon make the lake unsatisfactory for other uses (fishing and swimming). If the lake belongs to one, then action to limit waste disposal is unlikely, since no person has a right to demand such limits. However, if the lake belongs to those persons who own the surrounding land, then landowners and lake owners can each act to prevent use of the lake in ways that are incompatible with their own interests. If the number of owners is small, they may be able to reach agreement about use that preserves water quality.

(*ii*) **Tax on Output.** Since the production and consumption of commodities generate pollution, a straightforward means of limiting pollution would be to reduce such production-consumption activities by taxing them. In example, thus, a tax on automobiles would mean to reduce their numbers and thereby reduce air pollution from that source.

The costs of reducing pollution would be borne by those who generate the pollution the consumers and producers of iron and automobiles in the form of higher consumer prices and lower producer incomes. The revenues from such a tax could be used to compensate those damaged by the pollution that remains or for general purposes of government.

The main disadvantage of taxing output is that it provides no incentive for reducing pollution damage by changing production processes—*i.e.*, by placing filters on smokestacks or by designing autos that produce less pollution. There is also the problem of determining the appropriate tax rate, which may change over time as the damages from pollution change and as the costs of and demands for products change.

(*iii*) **Tax on Emissions and Effluents.** The government could directly tax the pollution output. Such a tax would encourage the producers to reduce pollution by reducing output or changing the process of production so that less pollution is generated. But emissions tax would raise the iron producers costs and therefore result in lower output and a higher price for the product. Similarly, an emission tax on auto would encourage production of low-emission cars, even though such cars might be more expensive. The price of cars would tend to rise on the average and their number would tend to fall. However, to achieve a given degree of control, an emissions tax would raise price and reduce output less than would a tax on output. With an emissions tax, some control would likely be obtained by changing the production process so that less pollution is generated per unit of output (per ton of iron produced or per mile driven). Like the output tax, emissions tax places the burden of control on those who generate the pollution. Again there would be problem of determination of rate of tax.

(*iv*) **Standard and Regulations.** Another solution lies that government can set and enforce pollution standards and attempt thereby to directly control the level of pollution. Standards can be apply to the emissions by the producer or to the quality of complying with the standards would be borne by the producers or their customers or by both, just as was the case with taxation. The major difficulties with standards determination of the standard and then enforcing it. Therefore enforcement requires government monitoring of emissions or air quality or both.

(*v*) **Pollution Permits.** Government can create and sell "permits" to pollute, while prohibiting pollution unless a permit is purchased. For example, a pollution permit might entitle its owner, say an iron producer, to allow one ton of a particular gas or dust to escape into the atmosphere each month. The number of permits issued would be determined by the

air (or water) quality that is sought. If the desired air quality standard can be met even though 1,000 tons of particulate are dumped into the air of a city each month, then permits that allow dumping of a total of 1,000 tons per month could be sold to producers in that city. Only owners of the permits would be allowed to dump wastes into the air.

Owning such a permit would be advantageous because the producer would be allowed to operate with less expenditure on pollution control (less elaborate and expensive filtering and cleaning of the smoke by products of production would be necessary). Producers would bid for permits, with the amount of their bids depending on the amount of pollution control costs that would be saved by owning a permit.

(*vi*) **Subsidies and Public Production of Pollution.** Public subsidies can go a long way to encourage pollution control and public production of pollution control (as occurs when cities treat waste water from homes and industries to reduce water pollution). Tax-payers are unlikely to generate pollution in proportion to their payment of taxes, and the subsidy and public production mechanisms of control tend to be more advantageous for those who pollute. Public subsidies and production of pollution control, assign the rights to use air (water) to those who pollute. That is, they imply that pollution is legal.

Subsidies may take the form of direct grants or tax breaks for producers that install specified pollution control equipment. Or they may take the form of publicly financed research aimed at discovering production processes that produce less pollution. Subsidies may be used in conjunction with standards, in which case standards are imposed but government pays part of the costs of meeting those standards. For example, the federal government imposes standards on sewage treatment by cities and provides federal grants for construction of sewage treatment facilities.

The major disadvantages of subsidies and public production is that they offer no monetary incentive for the reduction of pollution at its source by changing processes. Even then, subsidies and public production is an reasonable method to reduce market failures and bring efficiency.

Self Review Questions

food and pleasure. (10) Unit III Semester II

Q.6

3. MARKET FAILURE FOR ENVIRONMENTAL GOODS

Meaning. Market failure occurs when markets do not maximise social welfare. Market prices are a valid indicator of value where the goods concerned are private have no indirect effects (enternalities) and are exchanged in small quantities in competitive markets. In these restrictive circumstances the free market result in socially optimal behaviour. The best and ideal situation is prevailed in perfect competition where is resource allocation has been done by market mechanism. Maximum social welfare condition is observed in which benefits of one side cannot be increased without decreasing the benefits of others by reallocation of resources.

Most of the issues involved with environmental goods violate this special case. Many of the goods derived from environment are public not private, considerable externalities are present and such limited markets

as exist are not competitive. The market in environment goods is either non-existence, incomplete or distorted. As a result, market prices do not reflect value. Market failures is due to improper, wastages and inefficient distribution of resources.

Reasons for market failures. The particular reasons for market failures for environment goods can be discussed under the following headings :

I. Property Rights. Property rights theory provides much of the explanation for why biodiversity is lost despite its value. There are three types of property rights,

(*a*) **Private Property.** Which is subject to exclusive use and individual possession.

(*b*) **Common Property** is in a sense midway between pure public goods and private goods. Access to many local resources in developing countries is restricted to members of a particular community and exploitation is frequently controlled by community rules and regulations.

(*c*) **Open-access common property** means resources belong to everybody, access is open to all and nobody has an individual incentive for conservation. This is so called 'tragedy of the commons.' Many of the goods and services derived from environment are open access public goods in the sense that consumption is non-rivel and non-exclusive.

Private and common property rights affect the rate of bio- diversity loss in different ways. Open-access common property resources are at greater risk of over exploitation and species extinction. In some case open access resources have no market price. Their unintended destruction and over-exploitation incur no financial loss to a individual even when the economic value to society may be considerable.

II. Externalities. When costs benefits moves towards the third party, it is known as externalities.

According to S.K. Nath. "External effect exists whenever, due to the nature of present economic and social institutions, costs are imposed on others which do not have to be paid for or benefits are bestowed upon others for which no payment received."

There are two types of externalities :

(*a*) External benefits economy or external benefits.

(*b*) External diseconomy or external costs.

A Koutsoyiannis explains about this discrimination that, "when the action on an economic decision maker create benefits for others for which he is not paid, there occurs external economy. When the action of a individual agent creates costs for others for which he does not pay, their occurs external diseconomy for others.

Externalities create difference between personal expenses and social expenses. The pollution cost is not recognized. The importance of social cost is more than individual cost. In economic terms, the price of the resource will be less than its "marginal opportunity cost" *i.e.* the direct

and indirect costs to the user, the benefits foregone by using the resource now rather than in the future (Marginal user cost), and the marginal external cost. The net result of ignoring the marginal external cost is that too many environment goods will be lost.

Effects of external economy and external dis economy is observed in consumption and production. Examples of consumption side are : if there are nice attractive well-smelled flowers and trees is the garden of the neighbour, other surrounding people are also derived benefits of that garden without paying a single rupee. Similarly, a bungalow owner keeps watchman for a security, the other householders also get his benefits without paying any money. Similarly, a passenger smoking in the bus gets pleasure and freshness, but that smoking is a harassment for others.

Examples of production side are : If one concern gives training and vocational education to his workers, now these workers join another firm, this firm gets benefits of that training without spending a single rupee. Similarly, if an industry is at river bank and disposes its wastages in the river, it destroy fishes living in the water. This is a disadvantages for the fishermen.

III. Market imperfections. In imperfectly competitive markets like monopoly, duopoly, oligopoly etc. resources are not distributed properly, meaningfully and skillfully. The production reaches at the equilibrium stage when marginal cost and marginal revenue becomes equal even at less than price that means production is less. Pareto optimality does not exist. Thus most efficient production cannot be gained by this system. It leads towards market failures. Complete market mechanism can work freely and perfectly in the situation of perfect competition only. In imperfect market situation, it is very difficult to control pollution problem due to lack of monetised value judgement of pollutants.

IV. Uncertainly and irreversibility. Uncertainty and irreversibility compound the problem of market failure and provide additional reasons why unadjusted competitive markets discriminate against biodiversity.

V. Intervention failure or Govt failure. There are social and economic costs of poorly conceived and implemented Govt. policies. Much Govt. intervention has largely, unintentionally added to those costs by increasing the loss of biodiversity. Habitat loss and overexploitation can be considered as reasonable proxies. Intervention failure may take two forms :

(*a*) **Ineffective positive intervention** which means failure to implement investing conservation policies effectively.

(*b*) **Unintentional negative interventions** means they are designed to meet other objectives without reference to the costs in terms of reduced bio-diversity. These interventions have been a large cause of biodiversity.

Measures to solve the problem of Market Failures. In underdeveloped countries, scarcity of resources is very grave problem.

So most effective and efficient distribution of resources is essential. Government must intervene and take due steps for this. Some tools are given as under :

I. Implementation of Property Rights. Ineffective and defective property rights are responsible for market failures. An industrialist does not calculate pollution costs and disposes his industrial wastes in the river because river is not treated as private property. But he will not able to do it, without paying compensation, if people living around river side want compensation.

Here it should be noted that if there are less numbers of the parties then negotiation and settlement become successful. This process becomes more difficult and less effective as the number of parties increases. In such circumstances, Government should interfere in this matter. In this context, Browning and Browning says, "therefore it becomes necessary for the Government to step in, many issues of great importance, such as defence, police protection, air and water pollution etc. and private market will not function effectively in these areas without some Government intervention."

II. Taxes and Subsidies imposed by Government. With reference to external costs and benefits, taxes and subsidies are suggested by the economists. Due to taxation, production will decrease and state of ideal production takes place, due to which the problem of improper allocation of resources shall be solved. While production shall increase due to subsidies and problem of insufficient distribution shall be solved.

Here how to calculate the external costs and benefits while projecting subsidies and taxes is a main problem. Suppose the Government wants to levy a tax on the concern which throws its pollutants in the river. It is difficult to evaluate harm to the people, harm to the hygiene and harm to the human life by monetary values. Same way, it is too difficult to judge external benefits in money terms.

III. Auction or sell of pollution permit. In era of industrial and economic development Government cannot abolish pollution completely because it increases along with the pace of development. Pollution is created by automobiles, disposal of industrial wastes in the water and in the air. Government can just fix the level of pollution and sell pollution permit up to that level. This method is successful in Singapore.

IV. Direct Government's Control. Government prefers direct control policy to control market failures and takes steps like to impose mandatory adoption of pollution control systems in factories, disposal of industrial wastes at proper manner and purification of pollutants etc.

Such laws have imposed in USA since 1960. In India implementation of environment conservation Act was started from 1986. According to this act, Government has a power to take suitable steps for conserving environment. The central pollution board has divided in some industries [illegible] restrictions on the industries like, cement, petroleum, thermal power, oil refinery, petro-chemicals etc.

V. Public Goods. The goods produced by Government are public goods. But actually, public goods are goods which have public usage and they are non-rival in consumption. Defence system, public gardens, Government's hospitals, schools, colleges etc. dams, roads are the best examples of public goods.

For some public amenities people are not willing to pay. They want to use it free of charge. If everybody tries to take free benefit of public goods, then it becomes necessary to collect its cost indirectly, even though it is unavoidable for social as well as economic development. Everybody gets some advantage of public goods. So here, the difference in consumable quantity is not important, but the sum which various customers are ready to pay is important. Thus demand curve of public goods is formed. The maximum production of public goods is fixed, where per unit willingness of payment becomes equal to marginal cost of that commodity.

VI. Complete Data. Incompleted and imperfect data is a main reason for market failures. Voluntary and self-controlled system is believed to be the efficient process, if customers are aware of availability, quality, prices, usefulness of the product and producers have total data of availability, equipments and machines, technology etc.

Thus, the problem of externalities arise when due to illogical behaviour of one party, interest of other party is beng jeopardized. It is the problem of lack of information. Thus, when market fails, the state should play an important role. Even Keynes has emphasized strongly the active economic involvement of the state.

4. ENVIRONMENT AS A PUBLIC GOOD; THE COMMONS PROBLEM ; PROPERTY RIGHT APPROACH TO ENVIRONMENTAL PROBLEM

Environment as a public good. The goods produced by Government are called public goods. This interpretation is not perfectly true. Actually public goods are goods which have public usage and they are non-rival in consumption and is non-excludable. Defence system, public gardens, governments hospitals, schools and colleges etc. are the best examples of public goods.

Fake public goods. Most of Governments are welfare Governments. Their main motto is to secure public welfare. Public goods are the best medium of this. So Government provides all amenities for public welfare. The Government provides gardens and museums, roads and pools, water service, hygiene, schools, colleges and libraries, radio and T.V. station etc. But here two signs of public goods are not found. The people coming after scheduled time cannot see museums, even if they are ready to pay entrance fee. Similarly, DD2 Metro programmes are public utility programmes. But each and everybody can't take its advantage. One has to either dish connection or to make alternative arrangement. So such commodities are called as a fake public goods.

For some public amenities people are not willing to pay. They want to use it free of charge. For example, people living in river side get hardship due to floods every year. But suppose a private company decides to built a dam. It calculates the per- capita cost. Now people shall be ready to get benefit of the dam but shall refuse to pay any cost for that. The problem of free rider is not solved by market system, so Government built the dam and without charging anything, gives its benefits to all.

The commons problem. There are three types of properties namely :

(*a*) **Private property.** It is subject to exclusive use and individual possession.

(*b*) **Common property.** It is in a mid way between pure public goods and private goods. While it is subject to individual use, it is neither owned individually, nor is it open access.

(*c*) **Open access public property.** Many of the goods and services derived from biodiversity are open-access public goods in the sense that consumption is not rival and non-exclusive. Wild plant germplasm, for example is seen as the "common heritage of mankind." Deep sea resources such as whales are also open access property. Open access resources belong to everybody, access is open to all and nobody has an individual incentive for conservation. This is so called "tragedy of the commons."

Open access common resources are at greater risk of over exploitation and species extinction. In some cases open access resources have no market price. Wild genes for example, are a zero priced resources. Their unintended destruction incurs no financial loss to the individual, even when the economic values to society may be considerable.

Property Right Approach to Environment Problem

Property Rights theory provides much of the explanation for why biodiversity is lost despite its value. There are three types of property rights.

I. Private Property. Private property is subject to exclusive use and individual possession.

II. Common Property. Common property is in a sense midway between pure public goods and private goods. Access to many local resources in developing countries is restricted to members of a particular community and exploitation is frequently controlled by community rules and regulations. Common property does not inevitably lead to resource degradation.

III. Open access public goods. Open access public goods belong to everybody, access is open to all and nobody has an individual incentive for conservation. This is the so called, "tragedy of the commons." Many of the goods and services derived from environment are open access public goods is the sense that consumption is non-rival and non-exclusive.

Private and common property rights affect the rate of bio-diversity loss in different ways. Open-access common property resources are at greater risk of over exploitation and species extinction. **In some case open**

access resources have no market price. Their unintended destruction and over-exploitation incur no financial loss to a individual even when the economic value to society may be considerable.

Implementation of Property Rights

Ineffective and defective property rights are responsible for externalities problems. An industrialist does not calculate pollution costs and disposes his industrial waste in the river because river is not treated as a private property. But, he shall not able to do so without paying compensation, if people living around river side want compensation. In such condition, he has to spend for the compensation and that will be included in the cost of production. Now pollute cost is not external cost and it can be said that ideal allocation of resources is performed.

In this context Browning and Browning says, "the Government may not lead to use taxes, subsidies or regulation at all, it needs only define and enforce property rights and that resulting market exchanges would produce an efficient resource allocation."

In an important article wrote by **Ronald Coase** in 1960, some very vital thoughts are put forward. According to him, Government may not internalise all externalities. Many cases of external costs can be disposed off by private transactions and settlements. Government intervention is not needed here. This is known as a **"Coase Theorm".** This theory originated from a view that rights of the property is benefited to one person but harmful to others. Then beneficial should pay compensation to the affected people.

If there are less number of parties, then and then negotiation and settlement become successful. This process becomes more difficult and less effective, as the number of parties increases. Suppose an industry throws its waste in the river and thousands of people are living at the river bank. In such circumstances, how an industry can negotiate with the large group ? Here the problem of externalities can not be solved by negotiations. So, Government should interfere in this matter. Many issues of great importance, such as defence, police protection, air and water pollution etc. are large group externalities or public goods and private market will not function effectively in these areas without some Government intervention.