Chapter III

ECOLOGY, ECONOMY AND DEVELOPMENT

There is a close linkage among the three terminologies Ecology, Economy and Development. The sustainability of an economic system depends on the ecological status of the economic system. Economic sustainability also depends upon the developmental pursuits of the economy. Ecology is the stock from which all wealth grows. Collapse occurs when the ecological system crunches. Ecological collapse is as likely to be the result of economic success as of economic failure. Because of the close connection between the two, Economists have formulated a number of theories dealing with the role of environment in an economic system, environment management, and economic instruments for halting over use of natural resources. It is necessary to enlist the linkages first and then go into the details of the economic instruments for dealing with the pollution problem.

Since the United Nations Conference on the Human Environment was held in Helsinki in 1972, interest in the relationship between economic development and the environment has passed through two phases. The first in the 1970s was concerned principally with the imminent prospect of exhaustion of non-renewable resources, such as fossil fuel and with increasing levels of pollution arising from economic activity. These fears were fanned by oil crisis of the period and the pessimistic global predictions of the Club of Rome of exhaustion of many non-renewable resources in as little as 50
years (Forrester, JW (1971)\textsuperscript{1}. The second phase of interest in conservation and economic development began in the 1980s and is continuing. It is characterized by much greater conservation of the living environment in the protection of the biosphere and in the maintenance of bio-diversity. The publication of the World Conservation Unit (IUCN) in 1980 marks the beginning of this new phase. In this new phase, Ecological Economics has become central.

The conservation of living things, even those not presently utilised by mankind is central to Ecological or Green economics. While Ecological Economics can be regarded as a part of Environmental Economics, it differs from Environmental Economics because of its greater emphasis on living things as being important for sustaining economic development, and \textit{i} or for the creation or maintenance of a ‘good society’. Since, living things, especially humans rely on the use of non-renewable resources to maintain their current state of existence, the depletion of non-renewable resources (such as fossil fuel) is also of concern to Ecological Economics. The problem of maintaining biological diversity is an important issue.

The importance of maintaining bio-diversity has been argued from two points of view:

(1) An anthropocentric or man centred point of view, (2) and a non anthropocentric point of view. The anthropocentric point of view is that genetic diversity is of considerable economic value to mankind and may be essential in the long term for maintaining the level and desired variety
of economic production. (Clem Tisdell, 1993)² Non anthropocentric reasons include the argument that mankind is part of a holistic organic community. Human beings have no right to exterminate parts of that community, but should live in harmony with it.

3.1 ECONOMICS VS ECOLOGY

An economy which treats natural resources as if they are free gifts is unsustainable and hence breaches the dynamic economy –environment equilibrium condition. Similarly, an economy which treats residuals as being subject to free disposal is also unsustainable. Economic models in which the environment is simultaneously a horn of plenty and a bottomless sink (Perrings, 1987)³ are dynamically unstable. Conventional general equilibrium models either ignore environment altogether or assume limitless substitution between resources. Any economic system that relies on prices as its means of allocating resources, both intra-temporarily and inter-temporarily, fails the test of environment-economy equilibrium. (Perrings, 1987). Essentially this is because changes in the economy have necessary implications for the environmental systems in terms of flows of energy and matter.

Economics and ecology often receive two different responses from natural resources professionals. Economics, which deals with the allocation of scarce human-made and natural resources, is viewed unfavourably by many who are concerned about effects of society on the environment and natural resources. Ecology, which deals with nature’s allocation of scarce resources, is more often viewed in a favourable light. Economics is burdened,
in particular, by a misperception that it is synonymous with finance. That is, financial decisions (i.e., profit, the “bottom line”, etc.) are confused with the much broader equity and efficiency concerns that provide the theoretical underpinning for economics. For many years, resource economists have addressed natural resource and environmental issues in theory and in practice. The most recent offshoot of these earlier efforts is the newly evolving field of ecological economics.

Environmental economics, a specialized branch of Economics, embraces the issues of pollution control, climate change, and protection of the natural environment, conservation of scarce resources, bio-diversity and economic instruments: issues in the resolution of which markets play little or no part, but in which vast natural assets need to be allocated sensibly to the common good.

Environmental problems are frequently characterized by the existence of externalities, the presence of free access natural assets such as the atmosphere and large stretches of ocean, ill managed public goods and assets, undervaluation of common property resources and inadequate environmental management either through direct regulation or through economic instruments.

To a large extent, environmental degradation is the result of market failure. That is, the non existent or poorly functioning markets for environmental goods and services. In this context, environmental degradation is a particular case of consumption or production externalities reflected by divergence
between private and social costs. Lack of well defined property rights may be one of the reasons for such market failure. The manufacturing technology adopted by most of the industries has placed a heavy load on environment, especially through intensive resource and energy use, as is evident in natural resource depletion, water, air and land contamination, health hazards and degradation of natural eco-systems. Large quantities of industrial and hazardous wastes brought about by expansion of chemical based industry have compounded the wastes management problem with serious environmental health implications.

3.2 ECOLOGICAL OR GREEN ECONOMICS

First and foremost, ecological economics is a Tran disciplinary focus on environmental resource management and policy. Ecological Economics does not belong to economics, ecology or sociology; it integrates across and transcends them all. Ecological Economics is a Tran disciplinary field that focuses on the three linked goals of sustainability, fairness in distribution and efficiency in allocation. As a result ecological economics have more interest in a vision of the future methods for analysing problems in new ways and institutions and instruments that are needed to implement this vision. The vision includes recognition that :

1. Our planet is essentially a closed system in which our societies are sub systems.

2. A sustainable future exists for all species that is constrained by the global ecosystem.
3. We should be cautious and humble given the many uncertainties that exist and

4. Our policies must become more pro-active, with clearer thought about the interrelationships of the earth’s subsystems.

Ecological Economics recognizes the limits on economic development from ecological carrying capacity. It is an approach where society and culture matters. It features an increasing awareness that global life-support systems are endangered is forcing us to realize that decisions made on the basis of short term criteria can produce disastrous long term results on a global scale. There is also a growing acknowledgement that conventional economic and ecological models and concepts fall short in their ability to address global ecological problems in a truly systematic way. Ecological Economics addresses the triple bottom line of integrated economic, environmental and socio-cultural sustainability. It is orientated to innovative research aimed at articulating the mechanisms by which human populations can strike a dynamic balance between economic development and the ecological constraints they face. This balance will constitute the foundation on which the future will be built.

3.3 ENVIRONMENT - ECONOMY LINKAGE

All economic activities either affect or are affected by natural or environmental resources. Activities such as extraction, processing, manufacture, transport, consumption and disposal, change the stock of
natural resources, add stress to the environmental systems and introduce wastes to environmental media. Moreover, economic activities today affect the stock of natural resources available for the future and have inter-temporal welfare effects. From this perspective the productivity of an economic system depends in part on the supply and quality of natural and environmental resources. The dominant pattern of production and consumption are causing environmental devastation including global warming, extensive pollution of air, land and water, a massive extinction of species and the depletion of resources. This harm is done in the name of economic growth, but while the growth greatly benefits some, it is inequitable as well as unsustainable. An unprecedented rise in human population has increased the pressure on ecological systems and overburdened social and ecosystem. The foundations of global security are threatened.

Natural and environmental resources have three economic roles; waste disposal, services related to the environment’s assimilative capacity; natural resources inputs into production and directly consumed life support services and aesthetic amenities. The natural and environmental resource input function is central to understanding the relationship between economic growth and environment. Water, air, soil, biological, forest and fisheries resources are productive assets. Whose quality helps determine the productivity of the economy? Focusing on this role of environment as a producer good in highlights the direct effect environmental problems have on economic growth. Thus economic management impacts on the environment and the environmental quality impacts on the efficient working
of the economy. Environmental degradation imposes coasts on the economy which results in output and human capital losses.

Lost labour productivity resulting from ill health, forgone crop output due to soil degradation and erosion, lost fisheries output and tourism receipts from coastal erosion or lost soil productivity from deforestation can be some of the manifestations of such reduced output. The impact of water and air pollution is particularly inverse to the younger, the very aged and the poor. Pollution control is thus linked to sustainable development and not a “luxury good” to be afforded after the development process has taken off.

Economic development without environmental considerations can cause serious environmental damage, in turn impairing the quality of life of present and future generations. Sustainable development seeks to combine the elements of economic efficiency, inter generational equity, social concerns and environmental protection. Sustainable development was defined by the 1987 Brundtland Commission as the meeting of “the needs of the present without comprising the ability of future generations to meet their own needs”.

The World Commission on Environment and Development (1987), which was established by the UN under the chairmanship of Gro Brundtland, former Prime Minister of Norway, pointed out in its Report, Our Common Future, that the world does not face a separate environmental crisis, separate energy crisis or a separate development crisis. They are all one. Broad area of concern of environmental, economic and social cannot be
compartmentalised or confined to local areas. The earth has become global village in which economic, ecological and social problems are interlocked and this calls for a holistic approach by governments to policy making. The Commission points out that 'Ecology and economy are becoming ever more interwoven – locally, regionally and globally – into a seamless net of causes and effects.'

### 3.4 SUSTAINABILITY OF ECONOMIC SYSTEMS

Sustainability, whether of economic systems, or of development or of ecosystems or of human society is currently a focal point for much debate about issues in Ecological Economics. Biological diversity helps to keep economic options open for the future. This is valuable, given uncertainty about the exact future economic use and worth of many biological resources, for example, particular species or varieties of species. Individuals place an economic value on biological diversity for recreation and enjoyment and as evidenced by their willingness to pay, for example, for tourism based on such diversity, as in the case of visitors and tourists to national parks. Given the strong desire for economic growth, especially in less developed countries, man induced extinction of species is likely to continue even though the consequences of this, for the long term economic wellbeing of man kind are uncertain and could be quite disastrous.

The level and pattern of economic development affect the nature of environmental problems. Between 1994-95 and 1997-98, the Indian economy has grown a little over 7% per annum, the growth of industrial
production and manufacturing averaging higher at 8.4% and 8.9% respectively during these years.

Environmental degradation is a result of the dynamic interplay of socio-economic, institutional and technological activities. Environmental changes may be driven by many factors including economic growth, population growth, urbanization intensification of agriculture, rising energy use and transportation. Poverty still remains at the root of several environmental problems. In a way, poverty is a cause and effect of environmental degradation. The bad effects of industrial development on ecology are: atmospheric pollution, desertification, generation of hazardous wastes, climate changes and decline of bio. Human life depends on healthy ecosystems which supply life sustaining resources and absorb wastes. However, current growth and consumption patterns are placing increasing stress on the ecosystems. Environmental degradation, bio-diversity loss, deforestation, and the breakdown of social and economic systems are a few of the signs, which indicate that ecosystems are stressed.

Ecosystems threatened by over harvesting or overwhelmed by more wastes than can be absorbed, lose resilience and may suddenly breakdown and settle into a different system with less resilience. This implies that there are thresholds at which the levels of stress will lead to the disruption of the system. The concept used to understand these critical limits and thresholds is ‘carrying capacity’ which assumes that there are a finite number of people who can be supported without degrading the natural environment and socio-economic and cultural systems and as such is an
indirect measure of maximum level of stress that the ecosystem can maintain. There is an ecological limit to economic and social activity. Man should accept the precautionary principle which asserts that there is a premium on a cautious and conservative approach to human interventions in the natural environment where our understanding of likely consequences is limited and there are threats of serious or irreversible damage to natural systems and process.

3.5 POSITIVE LINKAGE BETWEEN THE ECONOMY AND THE ENVIRONMENT

One of the most stringent areas of environmental policy debate continues to be the relationship between economic growth and environmental quality. Indeed past evidence indicates that much economic growth has come at the expense environment. But rather than these, existing necessarily an either – or – trade off between economic growth and environmental quality, the relationship is complementary. In the long run we cannot sustain economic growth and the betterment of human lives without preserving and enhancing environmental quality. From such an angle, development and the environment are positively linked. Sound policies to promote development will also promote environmental quality.

3.5.1 Policies that link Economic growth and Environmental Quality

Improving sanitation and water supplies, investing in soil conservation and improving the health and education levels of the populace, especially
women, will be key priorities (World Bank, 1992). Providing greater access to life care resources and family planning will help ease the environmental pressures brought by a rapidly expanding population. A better educated populace will also more easily adopt more complex environmental management tools. Promoting macro economic stability like low inflation rates, a stable and exchangeable currency and a climate conducive to investment can also provide a foundation for environmental improvement.

Thus environmental policies stress the positive links between economic growth and environmental quality. Similarly, economic policies should ensure that the value of environmental quality is accounted for properly in economic decisions.

3.5.2 Higher environmental standards and economic opportunities

It is sometimes argued that environmental regulations stimulate economic growth. As environmental problems are identified and become more critical, public pressure develops for higher environmental standards and new regulations are introduced by government. This creates market opportunities for pollution control equipments, for more environmentally sensitive products and for the equipment with which these products can be manufactured. Countries or firms which are early to develop the new technology for meeting this environmental concern will not only be ahead in marketing this product, they may also sell the technology to those firms behind in the development of new technology. Thus there may be ‘first mover advantage’. It might also be anticipated that in such circumstances, consumers
may well be responsive to the promotion of green products creating new marketing opportunities.

A further possible aspect may arise because it is often cheaper to adjust to higher environmental standards through the use of new technology, rather than by adding on end – of – pipe pollution control equipment. In successful economies which are growing relatively quickly, the rate of investment in new plant and equipment will tend to be relatively high and this creates more opportunities for technological change.

These arguments suggest that it is indeed possible for new environmental constraints to act as a stimulus to economic profitability and growth. It may also happen that countries where incomes are growing may show enthusiasm for higher environmental standards. Thus the causality of the relationship may work in the other direction too. Not only might higher environmental standards lead to higher profits, but higher profits might also lead to higher environmental standards.

Today some of the most polluted places in the world are found in the mega cities of the developing world such as Beijing, New Delhi and Mexico City. The World Bank estimated whether there was a general tendency, first for growth to act to the detriment of the environment, then for growth actually to promote positive environmental development and to support it. The result shows that in the first phase of growth, during which countries develop from extreme poverty to medium income, they will pollute more and more but after this, their pollution levels actually falls to the level
they had before they started developing. So it seems that it is possible to achieve high standards of living and still have an ever better environment (Bjorn Lomborg, 2005).

3.5.3 The U-Shaped Hypothesis

The U-shaped hypothesis reflects a widely held view that with economic growth and development all environmental indices initially deteriorate with increasing pollution of air and water, congestion, squalor and desolation. However, it is argued, a social and political reaction occurs that ensures a diversion of resources to pollution control and environmental objectives. Hence, with increasing material prosperity (rising GDP per capita) environmental excesses are curbed and environmental objectives pursued as a matter of public policy. Future developments are closely scrutinized. Hence private affluence abates public squalor. Evidence of this may be found in the OECD countries, and increasingly in the developing nations.

This U-shaped hypothesis is probably sound in respect of many elements in the environment such as gross industrial and domestic air and water pollution, the provision of safe and clean drinking water, drainage and sanitation, garbage removal, building standards, cleaner streets, litter removal, traffic management, the management of many toxic wastes and zoning of activities. The U-shaped hypothesis is less true in terms of the volumes of wastes to he collected, handled, processed and disposed of: general traffic and aircraft noise: traffic congestion: intractable wastes: marine pollution: and overuse of the commons.
It is an incorrect hypothesis in terms of greenhouse gases, particularly carbon dioxide, in relation to global warming without Draconian measures; the problem of radioactive wastes: the depletion of the resource base (e.g. forests, fisheries, water, fuel wood and fossil fuels) and the stresses on the carrying capacity of the Earth, in respect of population, fauna and flora, biodiversity and endangered species.

3.6 ECONOMIC INSTRUMENTS FOR ENVIRONMENT MANAGEMENT

Economic instruments are generally identified with tradable permits and user charges. It should be noted, however, that economic instruments are about incentives, flexibility, and understanding people’s behaviour and self-interest. The use of economic incentives allows policy makers to influence people’s behaviour to achieve social objectives in the most cost-effective manner. There were many traditional communities that had established property rights and user rights, and had provided incentives for its people to manage natural resources sustainably. Therefore, many developing countries had the experience and foundation that offered significant potential for the creation of incentive-based systems.

It is firmly maintained that the experience of developed countries with economic instruments is not readily transferable. Many modifications are necessary to be able to apply economic incentive systems in the developing and transitional country context. In addition, developing countries are not a homogenous group. Some are recently industrializing countries, some are relatively advanced and some are very poor. Therefore incentive
systems would vary among developing countries as well. It is necessary to design new composite instruments, by combining different economic incentive systems, because of a great variation in scale of industries, types of ownership, and variations of culture in a developing economy. The design, selection, implementation and enforceability of economic instruments depend on the local conditions such as level of economic growth and special conditions of the developing country.

Economic instruments provide the means or vehicle for internalisation of environmental degradation costs and resource depletion costs in a flexible and efficient way. Without full internalisation of those costs, a country cannot achieve sustainable development. It is stated that environmental problems are due to market, institutional, and policy distortions which result in the under pricing of resources, public services, and commodities. However, for the successful application of economic instruments, it is essential to have researched the environmental costs properly, taking into account the special conditions of developing countries and carefully implementing it in a manner which avoids disruptive effects and negative distributional impacts.

Depletion or user costs are considered in the production of goods automatically, if there are secure property rights and the social discount rate do not deviate too much from the private discount rate. However, with high private discount rates and/or open access resources, environmental costs are not taken into account unless forced to do so with incentive systems or command and control regulations. In other words there must be an intervention that equalises the private and social discount rates. Unfortunately,
the opposite usually occurred that was, the government provided subsidies

to induce higher production levels than was socially optimal, ignoring user
and environmental costs.

In order to internalise all costs, a government can impose a tax that
is equal to the amount of costs ignored and remove the subsidy. That tax
could be enforced with command and control measures, fines, or
imprisonment. However, some of those enforcement measures could be
unsuitable for non-Western cultures. Other measures that are more suitable
for other cultures include, slow withdrawal of perverse subsidies, introduction
of security of ownership, reduction of political and economic uncertainty,
use of command and control regulations or taxes or charges to internalise
environmental costs, and requirement of an environmental bond for resource
mining activities. It is important to internalise the costs of management,
enforcement, and monitoring with those instruments. It is stressed that the
internalization of environmental externalities reduces distortions in the
economy which can provide environmental, economic and fiscal benefits.

Governments must make a shift from taxes on value to taxes on
vice. It is noted how income, work, savings, values, and profits are often
taxed, while consumption, leisure, pollution and resource degradation are
often subsidised In addition, product taxes and input taxes are regressive,
and it is important to pay attention to distributional impacts. Often the poor
paid proportionately more tax because they spent more of their income on
products, while the wealthy were able to lessen their tax burden through
tax shelters.
Economic instruments are classified into seven categories: property rights, including ownership rights, use rights, and development rights; market creation, including tradeable emission permits, tradeable catch quotas, tradeable development quotas, tradeable water shares, tradeable resource shares, tradeable land permits, and tradeable offsets/credits; fiscal instruments, including pollution taxes, input taxes, product taxes, export taxes, import tariffs, tax differentiation, royalties and resource taxes, land-use taxes, investment tax credits, accelerated depreciation, and subsidies; charge systems, including pollution charges, user charges, betterment charges, impact fees, access fees, road tolls, and administrative charges; financial instruments, including financial subsidies, soft loans, grants, location/relocation incentives, subsidized interest, hard currency at below equilibrium exchange rate, revolving funds, sectoral funds, eco-funds/environmental funds, and green funds; liability instruments, including legal liability, natural resource damage liability, liability insurance, and enforcement incentives; and performance bonds and deposit refund systems, including environmental performance bonds, land reclamation bonds, waste delivery bonds, environmental accident bonds, deposit refund systems, and deposit refund shares.

3.6.1 Externalities

The study of externalities by economists becomes extensive in recent years due to the link between the economy and environment. Externalities are third party effects arising from production or consumption of goods and services for which no appropriate compensation is paid. Externalities create a divergence between the private and social costs of
production. Social costs include all costs of production of the output including the third party cost arising from pollution. Externalities can cause a market failure if the price mechanism does not take into account the full social costs and benefits of production and consumption.

The subject is very much concerned with the ways and means of achieving a sensible allocation of resources through such channels as emission and effluent charges, user charges for the treatment and disposal of wastes, environmental taxes, product charges, deposit refunds, tradable pollution rights, performance bonds, natural resource accounting, road pricing and the economic implications of sustainable development. The subject is therefore concerned with costs and benefits on a social and a global scale, transcending the narrower approaches of the past. The subject drives a path to a larger concept of optimization.

The imposition of a cost on the economy due to environmental degradation results in output and human capital losses. Moreover a growing body of epidemiological studies suggests that air and water pollution are taking a heavy toll particularly of people in the developing world, through ill health and premature mortality.

3.6.2 Externalities and Transactions Costs

Arrow, K. (1969) defines transactions costs as the costs of running the economic system. Transactions costs are the costs of gathering information decisions, negotiating agreements, seeing that agreements are
carried out, and enforcing sanctions when they are not. Transactions costs are often divided into information costs, contracting costs, and enforcement costs. Information costs are the costs of discovering what options are available and who is available to trade with. Contracting costs are the costs of reaching an agreement with one or more trading partners. Enforcement costs are the costs of making sure that the other side carries out its part of the bargain. Some transactions costs are themselves explicit parts of a transaction and are easily quantified. Most transactions costs are not so obvious but are just as real. Many transactions costs involve expenditures of time rather than money. Time spent comparison-shopping and haggling over price are examples of transactions costs.

The parties to a potential agreement will not need to expend many resources gathering information. Someone wanting to initiate a private agreement to reduce pollution would face a long and expensive period of gathering information. Getting several million people together at once to solve an air pollution problem is as impractical as getting several million people to agree on anything is unlikely. Contracting costs for a private solution to air pollution would be astronomical. The problem is not just the number of people involved but a combination of the number of people and the type of agreement required. There are many markets with thousands or millions of participants, but the actions in these markets generally consist of many simple bilateral trade. Fully internalizing air pollution would require a single multilateral agreement involving everyone who wants cleaner air and everyone who emits anything into the air.
If a private contract regulating air or water pollution could be worked out, the costs of enforcing it would be extremely high. Once again, it is not just the large number of parties involved; it is the combination of a large number of parties and the fact that anyone who does not live up to his or her part of the agreement will still benefit from all the actions of others who do their part to clean up the air or water. This is known as the free-rider problem, and it provides a strong incentive for people to cheat on agreements. We do not have well-defined property rights in air quality largely because transactions costs for market trades involving such rights would be prohibitive. No one has found it worthwhile to expend the resources necessary to create a legal right that would have no practical value.

Free-rider problems can be seen in terms of ill-defined property rights as well as large transactions costs. A free-rider problem exists when significant gains from trade can be captured by people who are not parties to the transaction. This will occur when the exclusionary aspect of property rights is weak or nonexistent.

The presence of transactions costs leads to a general converse of the Coase theorem: An externality will exist when property rights and transactions costs are such that transactions costs exceed the gains from trade that would be captured by the parties to a contract internalizing the externality. When the transactions costs for each party are greater than the gains from trade capturable by that party, there will be no agreement. When the net gains from trade from bringing an additional party into the contract
are less than the transactions costs of including the additional party, some parties will be left out of any contract.

Externalities are effects that are not taken into account in the decision making process because there is no market where the party causing an impact can make arrangements with the parties experiencing the impact. Thus externalities are impacts without contracts. Externalities may be technological or pecuniary, positive or negative. Important environmental externalities are often associated with open access to resources that is, the absence of property rights. Other externalities involve public goods for which exclusion costs are high and for which consumption is non-rivalrous. Externalities point to the existence of a situation where public or private action may improve the situation. However, what type of action and whether any action is appropriate depend on the circumstances.

3.7 SOCIAL COST

COASE THEOREM

Giving property right is an efficient means of allocating resources. (Ronald Coase, 1960). Coase argues that economic efficiency would be achieved as long as property rights were fully allocated with free trade in such rights. Trade will place resources in their highest value role; eventually. The theorem has been used to show that a solution to the problem of externalities is the allocation of property rights. Pollution can be then dealt with through motivations between owners and the problem resolved in some
suitable settlement. Market forces find the best solution to a discipline. He argues for dispute resolution, by negotiation outside of the courts, avoiding litigation. Coase argues that as a rule no form of government action was required to deal with externalities or public goods. There is no need for taxes, subsidies and public provision. Property rights, not government action would resolve problems. The argument is against government intervention.

Edward Mishan focused on “neighbourhood effects” generated by a wide range of economic activities (Mishan, 1967).⁹ stressed that the operation of firms or the doings of ordinary people frequently have significant effects, good or bad on others of which no account need be taken by the firm or the individual responsible for them, unless constrained by law or custom. Consequently, the market price of a good or service is not necessarily an index of its marginal value to the society. Hence the social value of a good or service may be well below its market price.

3.8 INTERNALISATION OF ENVIRONMENTAL COST

THE POLLUTER PAYS - PRINCIPLE

Two versions of polluter pays principle have evolved over time. The first equates the price charged for the use of environmental resources with the cost of damage inflicted on society by using them. The price charged may be levied directly on the process that generates pollution or as the purchase price of licenses that entitle the holder to generate specific quantities of pollutants. The polluter may find the charges greater than the
cost of abating the pollution using the pollution control equipment or by changing the process or fuels.

The difficulty with this process is deciding on the right price to charge, when the damage to society cannot be assessed in monetary terms in any realistic way. Further it bestows the right to pollute on any scale. In addition there is the inherent problem that the penalty paid may never reach the actual community affected or if it does it may never be distributed in an equitable way. An overriding problem is the problem of attributing atmospheric pollutants to a particular firm when there are several similar plants in the neighbourhood.

In a later version, the polluter pays principle asserts that the full cost of controlling pollution by whatever means to an adequate degree shall be undertaken by the polluter preferably without public subsidy or tax concession. Hence the potential cost of pollution to society at large is translated into pollution control costs which are internalized or reflected in the costs of production.

The polluter pays principle was affirmed at the UN Conference on the Human Environment held in 1972 and by the OECD in the same year. The principle was reaffirmed by the OECD 1985. Since then a hybrid philosophy has emerged stressing the need for over all statutory pollution control regulation and the setting up of ceilings augmented by economic instruments to encourage abatement activities beyond the requirements of regulations to yield a market in pollution credits.
3.9 ECONOMICS OF ENVIRONMENTAL POLICY INSTRUMENTS

There are broadly two instruments available to any government for pursuing policies aimed at improving environmental quality. The Command and Control (CAC) type of instruments directly restrict the quantities of harmful activities. There are other policy instruments that lean more towards Economic Incentives (EI). The former includes emission and abatement standards while the latter includes emission charges, taxes on production and consumption, and tradable permits.

3.9.1 CAC Instruments: Traditional Approach to Environmental Protection

Until about 15-20 years ago, the environmental policies actually chosen were heavily dominated by CAC approaches (direct regulations). In shaping the early environmental policies of the 1970s, policy makers instituted standard-based systems in keeping with prevailing legal traditions of dealing with activities deemed excessive by society. The early CAC regulations were often based on “end of pipe” solutions with little or no thought given to how pollution could be reduced through more systematic changes in the core production process or even in the product design. However, with the passage of time, even this pattern of regulation has started dictating the processes that should be used to meet the set uniform emission targets.

Though traditional in nature, the CAC type of policy instruments has also undergone changes and modifications. Presently, two broad types of
CAC regulations are discernible, viz, technology-based and performance-based. The former specifies the methods and equipment that firms must use to meet targets. The latter sets an overall target for each firm or plant, and gives firms some discretion in how to meet the standards.

While CAC (or direct) regulations were successful in securing the first tranche of emission reductions from previously unregulated industries, economists have long been advocating the use of EI as an alternative or supplement to direct regulation. Most importantly, economists argue that direct regulations ignore the possibility that some companies may be able to make reductions in emissions more readily than others and these regulations hardly give freedom to firms and plants about how to comply with the emission norms/standards. Moreover, the CAC approach involves more administrative costs of enforcing compliance. Of late, there has been a surge; or interest in EI approaches in environmental policy.

The underlying premise for economic instruments is to correct market failure by placing a cost on the release of pollutants. The cost will internalise the “externalities” into the decision-making process. Placing a charge or a fee on every unit of effluent released transforms the manufacturer’s decisions regarding how much he will produce and how he will produce it. Thus, the cost of effluent output would become an important part of total production costs, which the manufacturer tends to minimise. On the other hand, by adjusting the charge level or the cost attached to effluent, outputs, and the regulator can induce a different degree of
response from manufacturers and hence, control the overall level of pollution. By changing the charge level over time, the regulator has a relatively simple way of ratcheting up standards.

3.10 INNOVATIVE ALTERNATIVES: ECONOMIC INSTRUMENTS

Economic instruments are the alternative tools available for environmental governance. They control pollution by harnessing the power of the market to influence decisions. They are much more flexible to and dynamic when compared to the command and control technique. Direct regulation through statutes and subordinate rules has been the normal approach to pollution control and environment protection throughout history. This approach has been known as 'command and control'.

To understand the significance of economic instruments, it is important to understand what pollution is. From an economist's point of view, pollution remains unabated because the regulators or the market does not charge the industry for the pollution it generates. It is a market failure which arises because the polluter is not penalized for the consequences of his actions, which may be the discharge of polluted effluent into a river or the production of polluting products or disposal of toxic wastes.

3.10.1 Specific Economic Instruments for Caring For the Earth

Most of the Economic instruments outlined in Caring for the Earth are intended to make the polluter pay for environmental damage, thereby internalizing the social cost of their economic decisions. But the actual
polluter may not pay the whole cost because a part of it may be passed on to other economic agents in the chain of economic exchange. To some extent all the parties involved in the exchange and economic processes are morally responsible for environmental damage when it occurs at any level in the economic process.

3.10.2 Resource Taxes

The exact nature of resource taxes proposed in caring for the earth appears to imply taxes on the use of natural resources so as to reduce the level of their aggregate use. The document (IUN, 1991) suggest that they could replace existing taxes, or the money raise could be returned to the tax payer as subsidies for more sustainable technologies and practices.

3.10.3 Charges for the use of Natural Resources

These are taxes to use natural resources such as air or water as disposal sinks for wastes from economic activity and land areas such as garbage or refuse dumps for solid wastes. These charges should reflect the full social cause in making use of these facilities. This is likely to lead to the more efficient allocation of resources.

Tourism fees recommended for tourist visits to protected areas. But the situation is complicated from an economic point of view (Tisdell, 1972). That is to charge a monopoly price for entry to a protected area is usually not socially optimal from a Kaldor-Hicks point of view.
3.10.4 Subsidies for Environmental Protection

In some cases it may be appropriate to pay subsidy to economic agents to adopt measures to protect or improve the environment. Subsidies do have a role when positive environmental action is or can be taken by economics agents to benefit others. Subsidies may also in some cases have a role in encouraging economic agents not to engage in environmentally destructive behaviour.

3.10.5 Deposit/Refund Schemes and Performance Bonds

Deposit refund scheme and performance bonds are basically adopted as a measure to insure against non – compliance with an environmental requirement. To be fully effective as a guarantee the deposit should equal or exceed the coast of rectifying the environmental damage caused.

3.10.6 Tradeable Pollution or Resource use Permits

Permits to release pollutants or to use a natural resource up to some overall allowable level may be allocated by auction or on the basis of historical use and may be tradeable. The results of auctioning will depend upon the number of competitors or extend of competition in the industry. However, a tradable permit system can be an efficient method of controlling use of the environment. The document gives the impression that it may be seen as giving pollution rights to permit holders. To avoid controversy over this “Polluter-Buys” mechanism, money raised in this way is best ear marked
for compensation for environmental damage, clean up of pollution and restoration of degraded eco systems (IUCN-1992).\textsuperscript{13}

The use of economic instruments can help ensure a better balance between the conservation of environmental commodities, conservation of natural resource capital and the supply of man-made or non-environmental commodities. Many of our environmental and sustainability problems are result of deficiencies in economic systems which can be overcome to some extend by the use of appropriate economic instruments. The recognition of this in the document caring for the earth is an advance in policy perception compared to the world conservation strategy (IUCN, 1980)\textsuperscript{14}. The introduction of economic instruments should be gradual to avoid the sudden disruption of markets. In the long run, there would be a shift of resources from industries of high environmental cost to industries of lower environmental cost. Those industries which did not pay the full cost of their production would cease to exist. With the introduction of full cost pricing on an announced schedule, Governments can allow industries to plan accordingly and introduce the cost effective measures and appropriate technologies to meet the required policy requirements. In India, the “cost of pollution” does not figure in the total cost of production of the services or the good. The polluter bears no loss for generating pollution and therefore has no incentive to reduce pollution. Worse still, the current market economy, at times pays to pollute. A manufacturer might save on labour, material, machinery, and energy costs by not treating effluents. In economic terms these down stream impacts, the costs of which are not included are “externalities “that lie outside the manufacture’s decision making frame work.
The underlying premise of economic instruments is to correct this market failure by placing a cost on the externalities. The assumption is that they will force the market to internalize the externalities into the decision making process. The procedures will have to take environmental concerns into account to minimize their cost. Different types of economic instruments exist. The most common ones are pollution charges and tradable permits. Product monitoring, another effective economic instrument can be applied to products such as fossil fuels, fertilizers, pesticides and lead acid batteries, the production, use or disposal of which generates pollution. Pollution is also controlled under a regime of environmental economic instruments by charging in anticipation of generating pollution.

Some economists advocate economic instruments should replace command and control regulations in totality. But in practice, economic instruments have nowhere replaced the existing system in entirety; rather they have been employed within a broader mix of regulatory instruments or as supporting instruments to the command and control mechanism. Carter Brandon lead environmental economist, World Bank says," Time is right for introducing the economic instruments in India" [World Bank, (1992).]

3.11 SURVEY-BASED VALUATION APPROACHES

Several valuation methods have been developed in an attempt to value environmental benefits in the absence of data on market prices. These methods rely on asking consumers directly about their willingness to pay for a benefit, or to be compensated for a loss. The contingent valuation
approach is the most well known, seeking personal valuations for increases or decreases in the quantity of some good or service, contingent upon a hypothetical market. Another approach, the Delphi technique, relies on the direct questioning of experts (or community leaders), and involves far fewer people. Other techniques such as trade-off games or lotteries, based on concepts of decision theory and utility theory have also been developed. In trade-off games, people are asked to choose between different bundles of goods. Several good techniques of surveys for valuing the environment have been published, among which are Cropper and Oates (1992), Hufschmidt (1983), Pearce and Markandya (1989) and Smith and Desvousges (1986).¹⁶

3.11.1 Contingent Valuation

Contingent valuation is a method of establishing a monetary value for a good or service by asking people what they are prepared to pay for it. The good or service in this context would be an environmental amenity, clearly of value but falling beyond the range of the market economy and therefore unpriced. The method seeks to determine a level of payment acceptable to most people; it can determine the willingness to pay for a better environment, or to accept compensation for a degraded environment.

3.11.2 Bidding games

The simplest approach here is direct questioning, individuals being asked how much they are prepared to pay (or how much extra they are
prepared to pay) to enjoy a particular environmental amenity, or bring about some environmental improvement. Bidding games can be applied also to the willingness to accept compensation for a loss of environmental amenity. Examples are to be found in Hufschmidt (1983). Bidding games can embrace such concepts as (a) option value, which refers to the price that people are willing to pay to maintain the possibility of using or visiting an amenity or site; and (b) existence value, being the price that people are willing to pay just to know that certain things are being preserved but which the individual may never see such as whales, polar bears, tropical rain forest, coral reefs or Antarctica.

3.11.3. Convergent direct questioning

This is a development of the first. Each individual is given a high value likely to exceed any reasonable willingness to pay, and a low value that almost certainly would be paid. The higher value is reduced and the lower value increased until the two values converge at an equilibrium value. The answers can be analysed in various ways.

3.11.4 Trade-off games

Each individual is asked to rank various combinations of two objects: a sum of money and some environmental attribute (such as water of a certain quality, or the preservation of a natural area). For any pair of combinations, the individual is asked to indicate either a preference of one over the other, or indifference. The marginal rate of trade-off of money for an environmental amenity is identified at the point of indifference.
3.11.5 **Money-less choice method**

Instead of using money as one of the objects, only specified commodities are used in combination with environmental attributes. The trade-off is again identified at the point of indifference. The monetary valuation of an environmental attribute is then obtained by substituting the current market value for the commodities chosen.

3.11.6 **Priority-evaluation method**

In this method each individual is given a hypothetical sum of money to spend on conventional goods and environmental attributes at assumed prices. The game might comprise five objects (four goods and one an environmental attribute) in three different quantities (giving 15 possible choices). As the budget is limited, quite clear choices must be made. True preferences and marginal valuations can be derived.

All of these methods must be viewed with caution. A willingness to pay may be overstated to encourage reservation of an area (turning more into a public opinion poll); or may be understated to minimize the possibility of a significant user-charge or levy. The questions themselves may condition the responses, and bias may be introduced by the interviewer or into published briefings. The conduct of the survey itself may exaggerate the importance of the issue. Certainly, all questions and briefings should aim at being true, fair and reasonable.
3.12 EVALUATION OF POLICY INSTRUMENTS

The common perception is that CAC policies achieve their objectives quicker and with greater certainty than EI policies. Another important issue is that almost all the policies are a blend of EI and CAC. These policies started with a major thrust on CAC elements but EI instruments were added or substituted. It may be argued that in practice, with a well-established regulatory system based on traditional measures already in place, the key issue will be to work out how economic instruments can complement and integrate with conventional measures. One potential application of economic instruments deserves particular mention. Many have proposed a “carbon tax” to reduce the carbon dioxide emissions that come from fossil fuels and which threaten to change the climate.

3.12.1 “Command and control” - a regulatory myth

Analysis of regulatory experience worldwide reveals the pervasiveness of negotiated solutions to industrial pollution problems. Rarely is there true command and control in the sense that industrial facilities conform immediately to clear instructions handed down by regulatory authorities. Part of the problem lies in principal-agent issues, since regulators generally depend on firms for much relevant information. Local reaction against threatened job losses can intervene, along with the local or national political power of the affected industries.

While command and control is often honoured in the breach, we have yet to see comprehensive systems of market-based regulatory
instruments. Nevertheless, successful reductions of sulphur dioxide emissions in Japan and water pollution in the Netherlands show that emissions charges can be very effective where there is enough political will and information to estimate and collect appropriate charges. Market trading in emissions rights within overall limits is also growing. U.S. sulphur dioxide futures can now be purchased in Chicago for $250 per ton, while Singapore has scored a brilliant success in reducing ozone-depleting chemicals by auctioning strictly limited quantities.

3.13 IMPLICATIONS

The next few years will be a time of testing for the World Bank, which strongly favours market-based instruments on efficiency grounds. A major task for policy research will be to assist in the design and implementation of appropriate market-based instruments as part of the Bank’s commitment to technical assistance for new environmental protection institutions.

The overuse or under-provision of an environmental asset can sometimes be the result of policy interventions to correct market failures that in turn have consequences for another set of problems - leading to a policy failure in the case of the latter. For example, countries may implement policies - to improve the competitiveness of certain products, industries, regions, or to support particular social groups - that have adverse environmental impacts. When the social costs outweigh the social benefits, this constitutes a policy failure, requiring offsetting corrections or even elimination of the policy intervention.
So-called perverse subsidies are an example. Many subsidies are introduced initially to stimulate the use of a good or service that is underutilised—fertilizer, electricity, water. But in the absence of sunset clauses and with the creation of a constituency based on perceived acquired rights, these subsidies can persist beyond their economically useful life and be detrimental environmentally. They can be economically costly if they sustain processes that would otherwise not be viable (for example, producing rice in California). They can also be economically harmful if they reduce the costs of environmental inputs to the point that eventual degradation of this complementary asset affects productivity (for instance, power subsidies in India encouraging the over-pumping of ground water) or if in attempting to benefit one activity, they harm others, so that their net impact is negative.

Energy subsidies, the bulk of which are directed to fossil fuels in both industrial and developing countries, entail economic efficiency losses. But they also have highly deleterious effects on the environment, some reflected in higher economic costs. Subsidies to fossil fuel and nuclear energy in Organisation for Economic Co-operation and Development (OECD) countries total $71 billion annually. Studies that simulate the effects of removing coal and other energy subsidies - either for individual countries or the world - all find significant environmental benefits in reducing CO$_2$ emissions. And most studies that look at the economic effects also find real GDP gains. The problem is not limited to industrial countries. While many developing countries significantly reduced their energy subsidies in the 1990s, they would still gain considerably by removing the subsidies altogether.
although it is often argued that these subsidies are needed to help poor people, the poor rarely benefit (World Development Report, 2003).

In general, subsidies encourage the use of the supported inputs, processes, or products - and reduce the incentives to find alternatives that may be more economically efficient. Fuel subsidies to fossil fuels reduce the incentive to develop renewable energy sources.

Although dismantling perverse subsidies may be good for society, some groups would lose. For example, studies looking at the effects of removing energy subsidies in industrial countries point to a significant loss of jobs in the coal sector (although there would be real GDP gains associated with their removal). Social considerations may thus call for incentive-compatible transfers and compensation, as well as other support (vocational training for other jobs) to enable the transition out of perverse subsidies.

3.14 ROLE OF ECONOMIC INSTRUMENTS IN MITIGATING CARBON EMISSIONS, AN INDIAN PERSPECTIVE

At the outset, the environmental cost of economic development is a matter of grave concern. At one extreme, environmental deterioration is seen as an unavoidable cost of industrialisation. At the other, it is viewed as a hindrance for developing countries to continue on a development path. However, there is no second opinion about the fact that carbon emission will lead to serious threats to civilisation in the future. In India, carbon
emissions will rise from 212 million tonnes in 1995 to 738 million tonnes in 2035, recording a compounded annual rate of growth (Garg) of 3.1 per cent.\textsuperscript{17} Carbon emissions could affect India dearly. Results from climate models predict that the average temperature in the country will change between 2.3 and 4.8 degrees Celsius following a doubling of the concentration of carbon dioxide from its pre-industrial revolution level (Longran 1998).\textsuperscript{18}

A carbon tax would essentially be a product charge placed on fossil fuels in proportion to their carbon content. The rising prices of these fossil fuels would induce people (a) to use oil and gas in favour of coal; (b) to use more renewable instead of fossil fuels; and (c) to be more efficient in their use of energy in general. Applying such a tax would ensure that the economy, as a whole, would achieve a given level of carbon dioxide reduction for the lowest overall cost.

The key issue countries face when considering green tax reform is the possible loss of international competitiveness of some sectors. Since the bulk of environment related taxes concern energy and transport taxes, there is an obvious risk that some industries may become non competitive. This is why these sectors are strongly opposed to environmental taxes and there is an explicit threat of relocation of activities to countries that do not apply such taxes. To date, environmentally related taxes imposed by OECD countries have not been identified as causing significant reductions in the competitiveness of any sector (Flip de Kam 2002)\textsuperscript{19}.

However, this may, in part, be due to the fact that countries applying carbon/energy taxes provide total or partial exemptions for energy-intensive
industries. The future economic development and energy policies of large
developing countries like India and China will have a significant impact on
the output of greenhouse gases. Even though the literature acknowledges
this, there are very few studies, which take into account the plausible
impacts of carbon/energy tax in India. In the absence of carbon/energy tax
in India, the studies could at best try to analyse the impacts based on some
models. (EPW, June 16, 2007) There needs to be an internalization of
positive externalities. An introduction of corrective subsidies and taxes such
as a combination of “green subsidies” and “brown taxes”, where the brown
tax should be equal to the marginal environmental damage and the green
subsidy should be equal to the marginal environmental benefit. For example,
taxes should be charged on logging and the revenue used to fund
reforestation. But the Government should be careful about subsidies and
make sure the investment they were making was efficient.20
Chapter reference


