CHAPTER – IV

ENVIRONMENTAL DOMAINS AND ECONOMICS

The evolution of economics has witnessed a deeply-rooted ideological divide between two distinct approaches - the *humanistic approach* (which is *life-centred* normative science) and the *materialistic approach* (which is *money-centred* positive science) –both relating to the manner in which humankind organizes resources to meet their needs and develop an 'economic-civilization'. Economics - the mode of resource allocation - determines the type of resource employment by a well-defined market-economy and is based on anthropocentric (money-centred) institutions, knowledge systems, technologies, and livelihood practices. Over the last four decades, discussions and actions towards a sustainable world supported by mainstream economic thoughts, especially the neo-classical economic theories and tools have failed in creating a shift in economic activities (production and consumption) towards a common and lasting future. This chapter tries to reveal the basic facts and crisis of this economic civilization by an eco-centric economic inquiry.

4.1 MARKET-ECONOMY: THE UNIVERSAL SET

A market-economy is a machine run by 'mechanisms' and driven by 'market forces'. A market economy is not only a utilitarian platform of arbitration but also a scarcity-ridden equilibrium model and the rationality of consumer and producer along with their 'claim' over resources (natural and man-made) are significant; it determines the economic power of an individual/State/Nation State. No one can deny the role of a market economy in the exchange of goods and services. In some cases, some States are commanding-economies where the public authority has more economic arbitration power among various market demands; however these carry the same features, purposes and functions as a market-economy.

In the present supply-side economics - the hegemony of producer determines and solves the basic economic issues of how to produce, what to produce and for whom to produce. Production of goods means maximum output possible with any given set of inputs, '*assuming inputs are used efficiently*'. An efficiency gap - difference of assumed and actual efficiency - causes a higher degree of negative externalities. The 'natural-capital pacified' market-economy is seldom bothered about these negative externalities, because everyone in the economy is assumed to be a dependent producer where, producer and production is the means and end of the economy. The producer is an economic dynamic in relation to the exchange of goods than the consumer.

The behaviour of the producer and pattern of production in the contemporary market-economy is supported by modern neo-classical economic theories, which is featured and linked with perplexing economic theories and actions, such as well-defined market canons (efficiency, perfect competition, equity, well-being etc.), huge capital (financial) investment, sophisticated carbon-emitting technology, profit maximization techniques, bulk production of goods, over-extraction of natural resources and quality discrimination along with price discrimination. It is recognised that some basics of production theories are incapable to solve the emerging sustainability issues; thus the following basic terms are significant and contextual.

- 'factors of production'
- 'production externality'
- 'cost of production' and 'costing'
- 'producer's surplus' and 'consumer satisfaction'
- 'rational individual'
- 'ethically right economic activities'
- 'consumer sovereignty'
- 'ecologically viable production and consumption'

4.2 PRODUCER DYNAMIC AND FACTORS OF PRODUCTION

As a universal economic entity, the behaviour of market-economy depends on producer dynamic, which is analysed with the hypothesis that 'individuals are not independent utility maximizers, but dependent producers' (Cole 1999). The production theories start with a 'functional relationship principle'- production implies maximum possible output within a given set of inputs; functionally, a change in input causes a relative change in output. Inputs may be a produced good or natural good that is available directly or indirectly in the ecosystem. This means ecosystem is the base of inputs/raw materials and one of the 'factors of production'. The theories of production recognise land, which is a short and expressive term for natural resources, as one of the factors of production and that the other chief factors - labour, capital, technology and organization - are useless without its cooperation.

4.2.1 Beyond Labour, Capital and Technology: An Eco-centric Critique

According to Thompson (1919) "*Land is the basis of all production, the source of all economic wealth. From it, directly or indirectly, come all of the raw materials on which the whole process of production rests. Labour and capital take the raw materials of nature, and then create, as we have seen, utilities of form, place, time, or possession, but farther than that they cannot go. Land as such labours without reward and its products are free to him who will come and take them; who under conditions of modern society is the landowner. Of the three* (now five, including technology and organization) *chief factors in production, land alone is incapable of being appreciably increased in amount: for all practical purposes the surface of the earth is fixed in area, and its productive qualities are fairly well known".* Since natural resources (land) are critical in ensuring our livelihoods and are also finite in supply, questions relating to the allocation of these resources are of an inherently ethical nature.

Under classical economics (Thomas Malthus "An Inquiry into the Nature and Progress of Rent"-1815 and John Stuart Mill "Principles of Political Economy" - 1848), land has a good command in economic analysis; where production means agriculture products with the cooperation of land and labour. But, interestingly, the break out of industrial revolution in the West and resultant shift from subsistent agrarian economy to commercial industrial economy added a few more factors of production viz. capital, technology and organization that abased the role of land in economic analysis. What do we infer from this?

Inference I

Since the pattern of economic analysis changed, labour attained greater concern under Marxian theories and institutional economics. Capital and technology became the prominent factors of production under capitalist economies and modern neo-classical theories. World Wars-I & II and the resultant political turmoil all over the World directed the Nation States to accumulate more wealth which were supported by industrial revolution and the new-age business corporate. Even the USSR - the so-called command economy of Marxian pragmatic wisdom - formed the part of industrial revolution. In short, the last century - the technocratic-capital intensive industrial revolution - has accounted for natural resources/land as an input for material production and economic growth (wealth accumulation) rather than a factor of production or a base of economic-civilization.

Inference II

The political history of the world - rise of the modern West powered by market-economy (laissez faire) since Renaissance (from feudal-agrarian economy to urban-industrialised-capitalism) - has witnessed large scale international trade practices; colonialism (source of raw materials for industrial revolution); competitive market for goods and services; technological innovations; economic and political treaties and alliances since the First World War; emergence of new

democratic countries; new international trade negotiations like GATT and liberal economic policies; development of new monetary and trade organizations like World Bank, IMF, WTO etc. and the evolution of economic theories from classisism to neo-classisism via Marginalism, Marxism, Institutionalism, Keynesianism and Monetarism. All these subsequently recognized financial/monetary capital as the efficacious factor of production and subdued the role of natural capital in economic analysis.

Inference III

As a political ideology, rather than economic, Marxism has been widely accepted as a policy weapon, which came into power in several European and Latin American countries in the late 19th and early 20th century. It marked a feudal-capitalist counter-revolution in the political and economic history, empowered and organized the proletarians (industrial workers) against exploitation of labour for enhanced wages, working and living conditions under increasing industrialisation. The collective bargaining power of labour unions for higher wages and abolition of bonded labour, all over the world, placed labour as a capital or prominent factor of production in economic theories.

Inference IV

Instability of output under trade unionism, increased demand for goods from various part of the World, efficiency arguments for profit maximization, development of science and technology, innovations of new machines, the end of colonialism and bonded/ hired labour, restrictions on free flow of raw materials from the newly independent countries etc. have forced the industrial West to switch over to capital-intensive techniques to ensure large scale returns and efficiency in production, later followed by the developing Asian and Latin American countries. Thus, fixed capital (factors of production) became more significant in production theories than land.

Inference V

The modern market-economy is a highly sophisticated economic entity. It is recognized that expansion of production and trade (profit maximization) depend on well-prepared, designed and planned market strategies. Besides, emergence of new techniques, machines and specialisation and division of labour demands more skilled and professional labour and management manpower rather than unskilled inexpensive labour. Thus, organizing a modern firm becomes much expensive and acquisition of land, selection of employees and techniques, development of market net work for distribution of goods, timely or regular checking of consumer satisfaction etc. become part of the organization (a relative late comer in production theories). As a decision-maker, 'organization' determines how to, what to, whom to, where and when to produce and distribute goods. Here, organization takes 'land' as fixed capital or a rented capital (a place to erect the building and machinery-physical asset) rather than a natural resource, while other natural resources in the production process are unaccounted or nominally accounted due to their free accessibility.

Inference VI

Lastly, the most important inference is that, the neo-classical economic tools except environmental economics consider society as a market and ecology (ecological goods, not having the classical meaning as 'land') as a factor of production. However, the cost theories and pricing practices under neo-classical economics fail to determine the value of invaluable environmental domains (factors of production) viz. water, land, air and supporting ecosystems. Moreover, the cost and production theories are revolved around monetary investment or financial and manmade capital. Thus, the significant role of natural resources as capital has knowingly or unknowingly been sidelined from the cost theories though they enter in external costs debates or the so-called '*land'* cliché.

4.2.2 Cost, Price and Externalities: A Critique

Generally, the total costs incurred in the production process of a commodity can be divided as 1.Material costs 2.Wages and 3.Other Costs. These can be broadly classified as:

1. Prime Cost =Direct material + Direct Wages + Direct Expenses.
2. Production Overhead = Indirect Material+ Indirect Wages + Indirect Expenses.
3. Cost related to other functions = General administrations + Sales promotion and marketing.

In this regard, the producer accounts the total cost of the production and sets the price with a normal profit.

The main drawback of this cost-accounting technique is that it does not take into account the externalities, from the society's point of view. The divergence between the so-called pricing mechanism (based on total cost) and the "efficient allocation" (of resources among people) dictum of welfare economics compels economists to re-examine the social cost as a problem faced by society.

4.2.3 Private and Social Costs: Mainstream Arguments

The conventional economic theories assume that all types of production, product and services have their own exchange value. So the concept like external costs, opportunity costs, environmental costs and other costs revolve around the 'exchange value' or trade-off canon. According to the Oxford Dictionary of Economics, external costs or diseconomies are damages to other people of the environment and ecology. In other words it is the 'spill over cost'[1] by the producer, but this far-reaching cost borne by the society is often omitted.

Externalities can arise between producers as well as between customers. Externalities can be negative or positive. From the social point of view, the firm

produces too much output. The efficient output is the level at which the price of product equals to the 'Marginal Social Cost of Production'[2]. Marginal Cost is the cost of producing the final or the marginal unit of the commodity. It can be measured. But the main problem is that of estimating the Marginal Social Cost .So the most widely accepted concept of cost is the total cost supplemented by 'money cost of production[3], 'real cost of production'[4] and 'opportunity cost of production'[5]. There are, however, certain costs which arise due to functioning of the firm but do not normally figure in the business decisions, nor are such costs explicitly paid by the firms. Instead, such costs are borne by the society. Thus, the total cost generated by the firm's decision may be divided into two categories: (i) those paid out or provided for by the firms; (ii) those not paid by firms including use of resources freely available and the disutility created in the process of production. The costs of category (i) are known as *private costs,* and of category (ii) are known as *external* or *social costs. Private costs* are those which are actually incurred or provided for by an individual or a firm on the purchase of goods and services from the market. For a firm, all actual costs, both explicit and implicit, are *private costs.* Private costs are internalized in the sense that "the firm must compensate the resource owner in order to acquire the right to use the resource." It is only the internalized cost which is included in the firm's total cost of production.

The total expenses or costs in the production process can be classified under two major heads- economic costs or financial costs and external costs or social costs. Economic cost is the cost incurred to the gathering of Land, Capital, Labour and Technology for production and its maintenance and operation. The Cost Benefit Analysis, Input-output Analysis, the optimum allocations of resources and factors of production techniques signals a producer to select particular combination of factors of production, which will maximise his profit. The price determination is based on these techniques, particularly the Scale of production and Scale of returns. The cost beyond these, like pollution caused by the firm, displacement of the people by installation the plant and compensation for the health problems

arising in the surroundings are considered as external cost from the viewpoint of the producer. Most decisions regarding price and production are taken on the basis of money value of input and output rather than their physical quantities and external costs.

4.2.4 Social Cost: Search for a 'Normative' Conclusion

Social cost, on the other hand, implies the cost which a society bears on account of production of a commodity. Social cost includes both private cost and the external cost. *External cost* includes (a) the cost of 'resources for which the firm is not compelled to pay a price/ e.g., atmosphere, rivers, lakes and also for the use of public utility service like roads, drainage system, etc.; and (b) the cost in the form of 'disutility' created through air, water, and noise pollutions, etc (Dwivedi 2003). For instance, Mathura Oil Refinery discharges its wastes into the Yamuna river causing water-pollution causing danger to the beauty of the Taj Mahal; mills and factories located in a city cause air pollution by emitting smoke; cars, buses, trucks, etc., causes both air and noise pollution. Such pollutions cause tremendous health hazards which impinge a cost on the society as a whole. Such costs do not figure in the cost structure of the firms and hence are termed *external costs* from the firm's point of view, and *social cost* from society's point of view. The cost of category (b) is generally assumed to be equal to the total private and public expenditure incurred to safeguard the individual and public interest against the various kinds of health hazards created by the production system. But private and public expenditure serve only as an indicator, not as a measure, of public disutility.

'An externality exists, when one agent's activity has an effect (either positive or negative) in the welfare or cost of another economic agent and the utility insufficiently takes account of that impact in its own private decision making' (Hohmeyer and Ottinger 1992). Neo classical economists would refer to most of these costs as external costs. But the social cost and external cost differ on many grounds.

Primarily, it is impossible to analyze the social cost without its structural relations to other costs. The earlier definition of social cost provides a clear vision about the basis of social cost which is the value or price of nature and its mismanagement through pollution, misuse and over utilization. In other words, it is the disutility created by producer or consumer of goods and services on common heritages like water, air, soil and so on. Also the producer/consumer is not willing to pay the actual price or value of these commons due to inefficient cost-estimating techniques. They are not willing to accommodate the value of common resources in their cost accounting, because natural resources are taken to be a gift of nature.
Secondly, the cost analysis is based on the production function i.e. from the functional relationship of factors of production. According to the traditional classification, there are four factors of production – Land[6], labour[7], capital[8] and organization[9].

There is no commonly agreed meaning for 'land' as 'nature' and economic theories consider it as a place/location where capital, labour, technologies and organizations function in a well-organised manner and which has rent value. So the pricing mechanism treats the value of land as rent. The failure to consider land as a natural resource and its value determination are questioned by environmentalists and the marginalized people in the neo-colonial liberalized global economy.

Thirdly, natural resources may be a free good, but it is also a public good. If it is a free good, it has no production cost, but they still bear a processing cost. If the natural resources are treated as public good, it must fulfil the public good criteria, which are: non excludability of consumers[10], joint consumption[11], non–rival consumptions[12], Zero marginal cost[13] and non-appropriation. When all producers agree to follow these norms while using the natural resources it will protect the ecology and human survival. But in actual practice, nature or land is a free good.

This leads to environmental deterioration and then subsequently affects the survival of living beings. Thus, this remains out of the cost analysis techniques.

Fourthly, the existing cost accounting methods fail to realize the basic dictum of welfare economics, which is 'any change that makes at least one person better off without making someone else worse off makes definitely an improvement in social welfare[14]'or must achieve 'economic efficiency[15]'. If any worse off happened, the public finance prophets like A.C. Pigou argued for the imposition of a tax on the products to compensate the worse off. But these taxes are mostly lower than the actual damage on the ecology due to producers' action. Taxes do not become a checking measure for the utilization of natural resources, because producers retain these tax costs through the enhancement of the price of the commodity. Ultimately the liability falls on the heads of consumers. It is justifiable from the side of pricing theories. But these prices are higher than the actual benefit and the producers do not take any steps to regenerate the natural resources and control the pollution.

Fifthly, in the production process, the producer takes into account only the opportunity cost of the factors of production. 'The opportunity cost equals the expected returns from the second best use of resources forgone to avail the gains of their best use' (Dwivedi 2003). It arises because of scarcity and alternative uses of resources. Some combinations of resources provide best utility to the producer and enhance the profit, but it may be harmful to the society. In such cases the society's combinations for those resources may be a different one and may provide an overall development and benefit to the society. From the of society's point of view we can call it as 'social opportunity cost[16]'.

Lastly, the conventional economic theories consider the external cost as social cost. At the initial stage of the production process it is true that the external costs are paid by the producers to counter and control the pollution and give some

compensation to the affected people through deterioration of the ecology. But the producers of the commodity and services ignore the consequences that are faced by the people living in the surroundings of the production unit over the future time period. The ecological imbalances lead to an imbalance in all the sectors of life. It questions the existence of human beings and other living beings and bio-organisms. This threatens the survival of the future generations also. The ecological imbalance pushes a society into poverty by ill health, reduction of productivity of land, scarcity of safe drinking water, low hygiene etc and human under development. Thus, while external cost realizes the problems from the side of the producer, it still remains to be argued that social cost must enter cost analysis from the side of society and should necessarily take into account the future generations also.

4.3 MARKET DYNAMICS WITH CONSUMER CHOICES

Demand-side economics, where consumer is the economy-leader is the flip side of Cole's (1999) argument that 'individuals are not independent utility maximizes, but dependent producers'. Therefore, this part of market-economy analysis is based on the hypothesis that individuals are not only dependent producers, but independent utility maximalists (consumers). And it is also assumed that a market is dynamic with perfect competition, transitivity[17] and consistency[18] of choices and utility maximizing rational individuals (consumer/producer) with non-satiety[19]. However, a number of other non-economic subjective factors play a crucial role in consumer behaviour such as taste and preferences, development of science and technology, changes in income, geo-climatic differences, socio-political ideologies and religious and cultural traditions. Thereby, 'monetary reductionism'[20] defines consumption as the act of buying goods and services, and it is assumed that consumption yields utility.

The demand-side economics is as blind as supply-side economics on issues of ecological and sustainable future. This can be explained as follows:

- From a biophysical point of view, it is observed that the utility maximising individual causes ecological deficit in the long run. As it is experienced by the contemporary market-economy, a large-scale diversified production and consumption of goods demand large-scale extraction and exploitation of natural resources which forms the basis of man-house.

- 'Rationality' of an individual is a misconceived terminology in economic analysis. It only means a selfish individual who is always greedy to maximise his/her utility. Ecological well-being is ignored.

- Perfect competition doesn't mean an optimum output or resource allocation but rather means a large number of producers who are aggressive grabbers of natural resources (technically called inputs) to enhance their output and profit.

- Non-satiety in consumption due to non-transitivity and inconsistency of choices. Where A=B and B=C, it doesn't necessarily mean A = C. Also A>B in one period doesn't restrict to B>A in another period due to subjective factors.

- 'Consumerism' is a resultant of subjective factors rather than objective economic factors.

- Neo-classical/ Post-Keynesian theory of consumer behaviour depends on sin principles viz. procedural rationality, satiable needs, separability of needs, subordination of needs, growth of needs and non-heredity (Lavoie 2005). Ecological factors and its correlation to economic wellbeing and sustainability are never attended to in mainstream economic theories of consumer behaviour.

- Environmental Economics (economics of negative externalities) considers the individual (consumer and producer) as a judge of his/her own well-being

(Willingness to Pay &Willingness to Accept) and is significant in making decisions about possible purchases. But, the ethical judgements over environmental issues are normally sidelined by 'purchasing power' principle. Producers have high purchasing power to pay more for environmental bads and consumers are willing to accept compensation which ends with an environmental disaster over the long-run.

- It is important to stress that the market-economy is ecologically unethical; and the common future of man-house and nature-house is also under threat. Therefore, it is to be recognised that working against ecology is not profitable in long run; because today's State benefits are financed by debts at the expense of future generations who will ultimately have to pay the bill. So well-defined policy options based on ecological principles are important to resolve these long run debts. Sustainability, precautionary, equity, human rights and participatory principles are inevitable for a sustained future.

- The 'materialistic interpretation of wealth' turns individuals into one dimensional beings whose sole purpose is to work to consume in support of the wealth creation process. It needs both fodder and energy to keep 'materialism' in motion. 'Rational individual' may be maximising utility (fodder) by being addicted to consumption. Once addicted, the so-called economic rationality will work to provide the energy for the process.

- By working to convert all values into monetary values (monetary reductionism), economists make money the be-all and end-all of human enterprises and endeavour.

4.3.1 Rational Individual and 'Surplus'[21]

It is assumed that a rational individual is either a profit maximising producer or a utility maximising consumer; 'surplus maximization' is the sole purpose of any

economic activity and can be differentiated as consumer's surplus and producer's surplus. These help to assess the gains and losses to society associated with any phenomenon that alters market price. Here, market price guarantees production cost and a normal profit to the producer; and producer's surplus might be equal to or higher than normal profit by an increase in output with the efficient utilization of existing factors of production. Similarly, consumers would be satisfied with the existing market price of goods and services and also benefit with reduced negative externalities in consumption. Therefore, it is a pre-conceived notion that by 'comparing these measures before and after a market disturbance, it is possible to quantify how society has been affected' (Callan and Thomas 2000).

'Consumer's surplus' can be defined as the net benefit to buyers estimated by the excess of marginal benefit of consumption over market price, aggregated over all units purchased (Callan and Thomas 2000) and determined by the willingness to pay (demand price or buyers' price) and what is actually paid (market price). When the buyer's maximum price exceeds the seller's minimum price (willingness to accept), it may be concluded that an exchange will take place at some point between these extremes i.e. the market price (Thompson 1919). Theoretically, exchange of a unit good at the buyer's maximum price produces little or no consumers' surplus. If, however, the exchange is at or near the maximum price set by the buyer for each of several units, consumers' surplus will increase. Nonetheless, the subjective factors tend the consumer to distribute the budget among different portfolio of goods, which will ensure maximum consumer satisfaction. The excess satisfaction from a given budget/market price is known as consumers' surplus. Similarly, producers' surplus is the net gain to sellers of a good estimated by the excess of market price over marginal cost aggregated over all units sold (Callan and Thomas 2000).

It is clear from the Figure 4.1 that consumer surplus is the triangular area above the price line Pm Ep and below the demand curve D.Pm.Ep. Producer surplus,

graphically, is the sum of all the vertical distances between the MC (supply) curve and the price line labelled S.Pm.Ep. The magnitude of the consumer surplus and producer surplus is related to equilibrium price and quantity and slope of the supply curve and demand curve. So any disturbance (economic or non-economic factors) to market equilibrium will change the size of surplus for both the parties-through the shift of demand curve and supply curve in the graph.

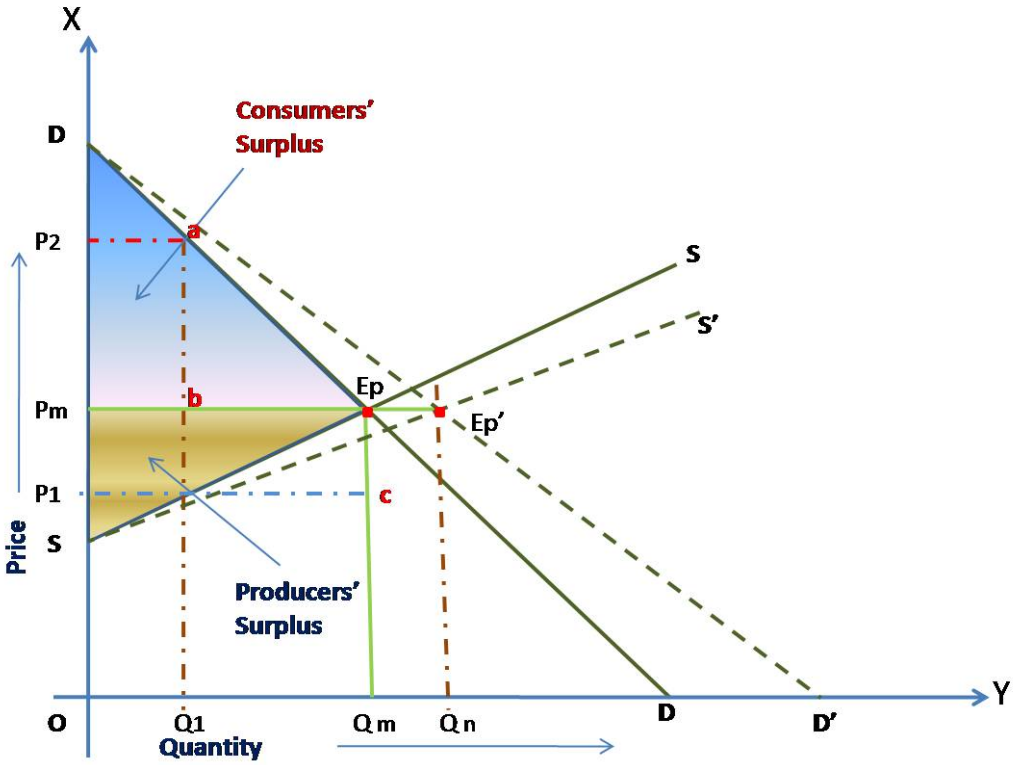

Fig. 4.1 Consumers' and Producers' Surplus

The following eco-centric conclusions are worthwhile here:

1. It is assumed that market is a place for exchange between profit maximizing producer and utility maximizing consumer. Consumers' surplus is a psychic-illusion of consumers rather than a materialistic presence of goods and services, and is well-governed by advertisements and market promotional strategies of producers. Producers' surplus is the cost of negative externalities; rational producers seek more profits in the short-run without taking in to account the intergenerational debts.

2. It is noticed that in a closed economic model with pre-set assumptions, the 'surplus' argument of the producer/consumer becomes flimsy due to the paucity of intangible subjective market factors in analysis (monetarist reductionism). Besides, tangibles like demand and supply, equilibrium market price, production and distribution costs, technological and allocative efficiency and other economic factors like income of the consumer, financial and capital investment of the producer and the presence of complimentary and substitute goods dominate in economic valuation techniques.

3. 'Surplus' analysis is the producers' propaganda with the notion that market-mechanism works perfectly only under perfect competition and heavy natural resource dependent industries are under imperfect markets, e.g. oil and natural gas industry, heavy metal industries, power generating industries, chemical industries etc. Imperfect markets never produce trustworthy market information in public such as total production, cost of production, efficiency of the plant, effluents of production, ecological impact of production, health impact of the produced good and so on. They always keep a perfect balance sheet of performance for their share holders which undermines the intergenerational ecological costs as well.

4. Expansion of production and consumption through perfect market competition doesn't always imply efficiency and optimum in demand and supply; the consortium of producers and consumers pass across the negative externalities by policy intervention and modification or by mass protest in democratic political system.

5. Even though the Marxist- institutionalism tried to account for the surplus value of labour, the value of invaluable viz. water, air, soil and ecosystem services have been technically ignored from the neo-classical production and consumption theories. At the same time the development economists and

ecologists are constantly trying to optimize the value of intangibles; however these attempts are dominated by the economic reductionism due to closed economic and ecological models and lack of co-ordination among ecologists and economists.

4.3.2 Economic Value of Environment: Neo-Classical Conclusion

The word 'value' has two different meanings: the utility of a particular good - called use value, and the power of purchasing other goods and services which the ownership of that good expresses - known as exchange value. The former is the neo-classical conclusion and latter the classical version of economic value. According to classical school of economics, value of an object is determined by the quantity of labour used to produce it (the embodied labour) at which the goods and services are exchanged. But, the neo-classical school argues that goods are exchanged based on the utility they provide their owners and that a good's utility is a function of the benefit it grants to its owner. Thus the way the neo-classical paradigm emphasizes use value.

The value theory, since Adam Smith (1776), has emerged through many theses and antitheses, where labour was the foundation stone. Later Ricardo's (1815; 1817) economic rent theory and Marxian surplus value theory (1894) emphasized the role of labour in production process which advocated pricing of labour. Ricardo was one of the first economists to describe the economic interaction between demand and 'natural resource quality'[22]. Smithian 'hunter's catch'[23] example helps the classical economists to explain the origin of profit and indirect labour costs. Similarly, the Marxian idea of 'class struggle' is used to explain many economic events, such as the working hours of labour, wage and profit rate and the type of technology used in production.

As an extension of classical thoughts, neo-classical economists put subjective human wants as the leading factor in economic valuation. Value of a

commodity/service rests in its desirability to people, so its value cannot be determined until it is exchanged in the market. It is market mechanism, which fixes the value of goods and services based on the quantity supplied, willingness to pay, income of the people and the utility that the good provides to people. Besides, the classical Smithian 'water-diamond paradox' contradicts the value theory based on utility in that, things which have the greatest value in use (water) have frequently little or no value in exchange; on the contrary those which have the greatest value in exchange (diamond) frequently have little or no value in use. Neo-classical economists subsequently resolved this puzzle in two ways:

a. The total utility of water clearly exceeds that of diamonds; however the marginal utility of diamonds is greater than the marginal utility of water.
b. The cost of diamonds is much larger than the cost of obtaining water due to the scarcity of diamonds (Young 2005).

It is clear from the classical-neoclassical discourse that value of a commodity it determined in the market according to its scarcity, marginal utility and production costs, where production cost depends on factors of production, especially labour, capital and technology. While, according to positive economics, the market integrates individual supply and demand, setting the value of goods and services; although this can be biased by the oligopolistic industries, externalities and hidden subsidies such as taxing policies, production incentives, price floors and ceiling (Hall et.al. 2008). The identified market failures are evaluated by economists and they suggest policies for correcting or ameliorating their effect.

Though the sophisticated, detailed and scientific 'closed economic models' have evaded the ecology and ecosystem services from their diagnosis, the fact is that the environmental domains - air, water, soil, solar energy etc. are free from labour use and production costs, and abundant in nature along with less marginal utility while constituting greater total utility. The type, quality and quantity of natural resources - fuel in particular - are becoming scarce and pressure on ecology is

mounting that sets general but definite limits on economic development and threatens the existence of life. Neo-classical economics tends to ignore these constraints while assuming that the ultimate end of the economic process is the satisfaction of our material wants and that the ultimate means for achieving this end are stocks of goods and services (Hall et.al. 2008). According to Pearce (1993), '*there is no activity that can rightly be called "valuing the environment". What economists do is to seek measures of individuals' preferences for environmental improvement or conservation or individuals' loss of well-being because of environmental degradation or from losing an environmental asset'.*

However, the fundamental question remains whether it is possible to value an environmental good. Because, according to O'Neill (1997), "*rational decision making requires monetary units and whether we like it or not, in making choices we are making monetary comparisons. The economist is merely making this explicit."* Environmental economics goes further and attempts actually to state the price of non-marketed goods.

4.4 VALUE OF AN ENVIRONMENTAL GOOD

'*The basic strategy for environmental valuation is the 'commodification' of the services that the natural environment provides'* with utility and production function arguments (Perman et.al 1999). However, the economic value of environment needs to be specified in the background of three important features of environmental goods viz. irreversibility[24], uncertainty[25] and uniqueness (Banerjee 2001; Dasgupta and Karl-Goran 2004; Kolstad 2006). There is no consensus among economists and ecologists as to what set of categories are truly exclusive and exhaustive in capturing the 'total value' of an environmental good except its use value. Therefore, the 'total value' of an environmental good has been categorised under two heads –"use value" and "non-use value". Hicksian and Marshallian monetary measures and supply-demand schedules have been descended due to the 'marginal' revolution at the end of 19th Century, where value

was determined by marginal benefits and marginal costs. Since this point, the 'subjective preference' theory of value dominated the discipline. Therefore, the 'use value' determination with subjective preferences becomes the final note of the market-economy models.

The emergence of 'environmental economics' or the negative externalities of production and its looming long-run consequences to cost of production forced the academia to think over the 'non-use value' of ecosystem services, which was hitherto ignored from valuation methods due to its lack of market accessibility as a tradable good. The standard neo-classical valuation methods have, in fact, been criticized for the drawbacks regarding the measurement of 'sustained economic performance' of an economy. These drawbacks include:

1. the neglect of scarcities of natural resources,
2. the neglect of the degradation of environmental quality from pollution and other human activity and
3. the accounting for environmental production expenditures as increases in national income and product (Bartelmus 1993).

The self-evolved, re-generative and symbiotically related ecosystem services (goods) are shaping, regulating and expanding our household economic activities which are categorised as:

1. inputs to the production by firms,
2. sinks for the assimilation of waste generated in production and consumption,
3. amenity services to households and
4. life support services for firms and households (Perman et.al. 1999).

The story is quite different in studies of ecosystem services. Although the non-use value is becoming a part of valuation techniques, the above said categorization is

market driven and anthropocentric in nature which revolves around commercial production or amenity services in point of time. Hence, the non-market goods are typically employed by environmental economists for the purpose of non-market valuation. By definition, non-marketed goods are not exchanged in markets, and therefore one cannot speak of equilibrium prices and quantities for the goods per se (Phaneuf et.al. 2007).

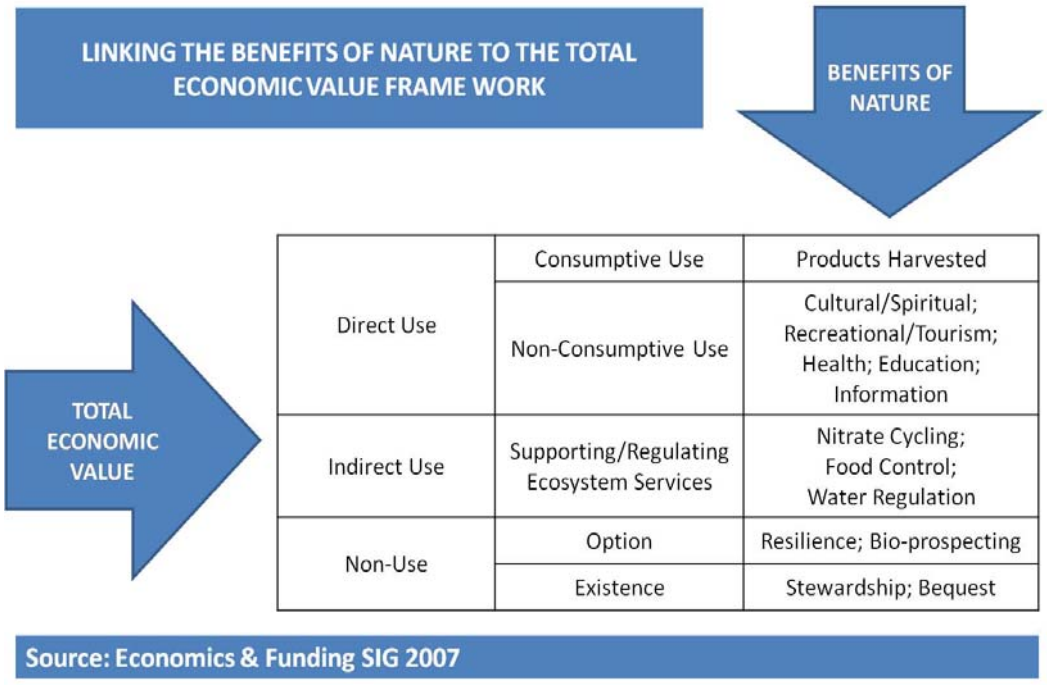

Fig. 4.2 Linking the Benefits of Nature to the Total Economic Value Framework

However, 'environmental valuation techniques' envisage 'total economic value' (see Figure 4.2) as an environmental cost (EC) viz. direct use of environmental goods, environment degradation and damages (sink cost and sanitation) and other services (water, soil, and minerals) of an ecosystem; where environmental cost is the sum of use value[26](UV), existence value[27](EV), option value[28](OV) and quasi-option value[29](QOV), i.e. EC = UV + EV + OV + QOV. EC is sometimes known as 'total value' (TV) and it is stared as: TV = UV + NUV, where NUV stands for 'Non Use Value', the sum of EV, OV and QOV.

4.5 TAXONOMY OF ENVIRONMENTAL VALUATION

There is not in the literature a single standard categorisation of environmental value, nor is the terminology uniform (Perman et.al 1999). For example, NUV is referred to as 'passive use value' (PUV) (Carson et.al. 1999) in some cases and can also be classified as existence value[30], altruistic value[31] and bequest value[32] (Kolstad 2006). Some environmental valuation cases are silent on quasi-option values; otherwise, it is differently conceptualised in literature; 'future use value', bequest value and vicarious value are the examples.

Owing to the partial knowledge on environmental imbalance, the current generation values the fact that the option of using resources remains open for the future. In future this option may become one's own benefit and is termed as the 'future use value'. If this future generation is one's own direct descendants, then the relevant option value is called the bequest value. Securing a pleasure by leaving the option open for others to enjoy a use value is called vicarious value (Banerjee 2001); theoretically, these are option or quasi-option values. Along with these conceptual chaos, there is no universally accepted 'phrase' in environmental economics for the total environmental value of ecosystem services; the terms 'total economic value', 'environmental cost', and 'total value' are used interchangeably. The term 'total economic value' is biased to use-value and market price theories; while 'environmental cost' is directed towards production costs and externalities of production as well as market conclusion on environmental cost recovery or compensation. The term 'total value' is more reliable since it balances the 'use-value' and 'non-use value' standards.

Even though the constraints persist, they rely on valuation methodology and valuation methods. Most of the environmental valuation techniques are biased to actual market-based subjective preference valuation methods because, 'they are founded in the theoretical axioms and principles of welfare economics' (Pagiola et.al. 2004). The total value can be assessed in terms of consumers' willingness to

pay (WTP) to acquire a particular environmental benefit or their willingness to accept (WTA) compensation for forgoing that (Pearce 1993; Pearce and Ozdemiröglu 2002; Banerjee 2001; Pagiola et.al. 2004). '*The WTP and WTA are alternative routes to arrive at the demand curve for the relevant goods in question'*. They reveal the preference of the consumer on environmental goods over other alternative bundles of goods/services (environmental goods and other marketed goods are included in the preference function) if the preference function is separable between these environment-related goods and other utility goods (Banerjee 2001).

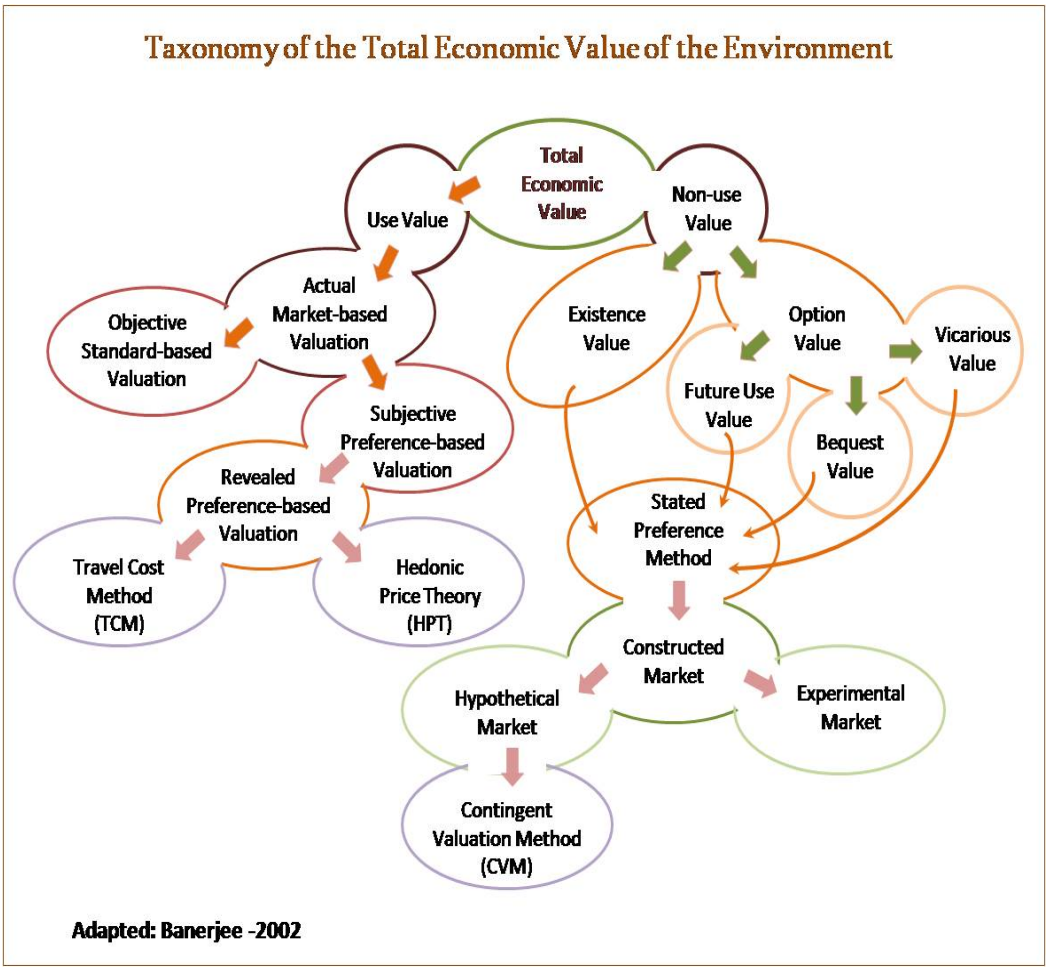

Fig. 4.3 Taxonomy of the Total Economic Value of the Environment

However, for any given problem, according to Pearce and Ozdemiröglu (2002), the valuation technique to be chosen - revealed preference (RP) or stated

preference (SP) - depends on the availability of appropriate proxy markets; if suitable proxy markets are available then RP approaches can be used over SP, which fit the needs of the analysis. Nevertheless, until the environmental domains are recognized as economic services, they will continue to be exempted from the actual market-based valuation. Figure 4.3 illustrates the taxonomy of total value of environment.

The following questions are vital here: why do monetary valuation, how do it and what are the pitfalls of valuations techniques?

Why do it?

- Foremost, it provides pure informational input to social decision making.
- It is necessary in order to illustrate the importance of biodiversity.
- It is able to produce a measure of national income that accounts for all kinds of environmental damage, and, hence, is a measure of sustainable income.
- It helps in setting priorities across sectors; as there are competing uses of the natural environment for farming and development or as a natural space, society needs to be able to choose which is best.
- It enables the policy-makers to develop 'green national income' accounting.
- Environmental valuation demonstrates the importance of an issue; for e.g. ill-health from pollution.
- It can be use in the legal damage assessment programmes.
- It is necessary the estimation of discount rates of environmental goods for.
- Last motive is the "cultural soup"[33] argument.

To conclude, the objective of ecosystem valuation is to determine the value of the total flow of benefits from ecosystems; to determine the net benefits of interventions that alter ecosystem conditions; to examine how the costs and benefits of ecosystems are distributed; and to identify potential financing sources for conservation (Pagiola et.al. 2004).

How do it?

It is unfeasible to convert the ecosystem services and benefits to monetary values. However, a variety of valuation techniques do exist. *The economic valuation literature indicates that the economic production function approach is a fruitful way to elicit direct and indirect use values of environmental systems* (Turner 1999). In general, the valuation techniques can be listed under three heads (see Table 4.1) viz. Objective Standard-based Valuation, Revealed Preference-based Valuation and Hypothetical or Stated Preference Method.

Table 4.1 General Environmental Valuation Techniques: Applicability, Strength and Weakness (pp. 121-23)

Valuation Approach	Valuation Technique	Valuation Methodology
Market Valuation	Market Analysis/Shadow pricing	Objective Standard Valuation
	Productivity Loss Estimates	Objective Standard Valuation
Applicability- Strength: It is relatively easy to use; it relies on observing actual market behaviour; it has little detailed modelling; it requires a simple statistical analysis.		
Weakness: Many ecosystem goods and services do not have markets or are subject to markets which are highly distorted or irregular, thus its applicability comes under question in some particular circumstances.		
Production Function	Dose-Response Method	Objective Standard Valuation
Applicability- Strength: It can be used to calculate the effects on production by any change in ecosystem goods and services.		
Weakness: The cause and consequences are often unclear, unproven or hard to demonstrate in quantifiable terms. Non-economic factors also play a crucial role in such relationships.		

<table>
<tr><th>Valuation Approach</th><th>Valuation Technique</th><th>Valuation Methodology</th></tr>
<tr><td rowspan="3">Surrogate Market</td><td>Public Pricing</td><td>Objective Standard Valuation</td></tr>
<tr><td>Hedonic Pricing</td><td>Subjective Preference-based Valuation</td></tr>
<tr><td>Travel Cost Method</td><td>Subjective Preference-based Valuation</td></tr>
<tr><td colspan="3">Applicability-Strength: Here travel cost method can be applied to the consumptive use of ecosystem goods; especially in recreational items. Whereas, hedonic pricing is superior in any context of wage and property markets. Public pricing is highly recommended in public investments and to the formation of surrogate markets.</td></tr>
<tr><td colspan="3">Weakness: These are expensive and time consuming methods, need very large data set and detailed information; this makes it difficult to isolate the value of a particular ecosystem. Hedonic pricing assumes wages and property prices being sensitive to the quality and supply of ecosystem goods and services; but it is undermined in a perfect property and job market.</td></tr>
<tr><td rowspan="5">Cost-Based Approach</td><td>Replacement Cost</td><td>Objective Standard Valuation</td></tr>
<tr><td>Averting Expenditure Method</td><td>Subjective Preference-based Valuation</td></tr>
<tr><td>Cost of illness Method</td><td>Objective Standard Valuation</td></tr>
<tr><td>Restoration Cost</td><td>Objective Standard Valuation</td></tr>
<tr><td>Human Capital Approach</td><td>Objective Standard Valuation</td></tr>
<tr><td colspan="3">Applicability - Strength: It is applicable to value, ecosystem services , the impact of environmental damage on human life and ecosystem etc; employed in response to the loss of ecosystem goods and services; data collection needs only limited time or financial resources; relatively small data requirement.</td></tr>
</table>

<table>
<tr><td colspan="3">Weakness: It is difficult to find perfect artificial alternatives for ecosystem goods and services; anthropocentric nature of this method may not match with expert's opinion; no chance of tallying loss and benefits; in most cases damages avoided remain hypothetical.</td></tr>
<tr><td>Valuation Approach</td><td>Valuation Technique</td><td>Valuation Methodology</td></tr>
<tr><td rowspan="3">Stated Preference Approach</td><td>Contingent valuation</td><td>Hypothetical Market Method</td></tr>
<tr><td>Conjoint Analysis</td><td>Hypothetical Market Method</td></tr>
<tr><td>Choice Modelling</td><td>Hypothetical Market Method</td></tr>
<tr><td colspan="3">Applicability- Strength: It can be applied in any situation, even if resources do not rely on actual markets or observed behaviour. They remain one of the only methods that can be applied to option and existence values.</td></tr>
<tr><td colspan="3">Weakness: Major disadvantages of stated preference method are the large and costly surveys, complex data sets, and sophisticated analysis techniques that it requires. Another constraint arises from the fact that they rely on a hypothetical scenario which may not reflect reality or be convincing to respondents. Also, it is confused over the following issues- a. "Referendum" contingent valuation is not incentive compatible; b. Survey researchers are information monopolists and c. Individuals do not know their preferences for complex public goods.</td></tr>
<tr><td colspan="3">Sources: Compiled from Smith 1997; Perman et.al. 1999; Sugden 1999; Munro and Hanley 1999; Langford and Bateman 1999; Bateman et. al. 1999; Bateman and Willis 1999; Bonnieux and Rainelli 1999; Loomis 1999; Munasinghe 2001; Pearce and Ozdemiröglu 2002; Pagiola et.al. 2004; Emerton and Bose 2004; Bolt et.al. 2005; Wills 2007; Schlapfer 2008.</td></tr>
</table>

It is remarkable that most valuation techniques are inadequate to account for a reliable standard 'value of ecology' (inclusion of 'prior value'[34] of environmental

services). Since, most valuation methods, even hypothetical/stated preference-based valuation methods, illustrate the demand for an environmental good or service in monetary terms through consumers' WTP/ WTA associated to a particular environmental change. It is argued that, "*Stated preference is based on what people say rather than what they do, but it is more flexible than revealed preference and can potentially be applied in almost any valuation context*"(Pearce and Ozdemiröglu 2002). Stated preference valuation techniques, resultantly deduce to "WTP/WTA" principle and in short, determine economic well-being of an individual.

4.5.1 Articulation of Well-being via WTP and WTA

Theory of environmental valuation has been rooted in and an advancement of neo-classical economic theories. Theories of consumer/producer behaviour can be used to derive methods for assigning the value of an environmental good (Perman et.al. 1999), which in turn, measures the economic well-being of an individual with the help of a closed economic model. The theory assumes people having well-defined preferences among alternative bundles of market and non-market (environmental) goods or services. Here 'people' need to 'environment-concerned' as well as educated (enlightened with environmental knowledge) rational economic persons. Rather than 'laissez faire' market dictum, 'the availability, accessibility, quality and quantity of an alternative bundle of non-market goods/services' that either be pure public goods or semi public goods are 'exogenously determined'. As a factor of production or an input in production, an individual therefore may be willing to pay or accept the externalities of production and consumption. It may increase/decrease the surplus of the individual or makes positive/negative changes in quality and quantity of the non-market goods/services. The monetary values based on maximum WTP and minimum WTA as compensation for non-market goods are measured in terms of four kinds of welfare changes viz. Compensating Variation (CV), Equivalent

Variation (EV), Compensating Surplus (CS) and Equivalent Surplus (ES) (Freeman 1993; Perman et.al.1999; Markandya et.al. 2002; Kolstad 2006; Banerjee 2001) and are the refinement of the ordinary consumer surplus concept.

The question is whether this is the right way to account for the environment in social decision making? According to Common (2007), with a caution, *and assuming well-informed economic agents, for those who accept the preference based utilitarianism and consumer sovereignty- the answer to this question is 'yes'.* Given such acceptance, valuing the environment in terms of WTP and WTA is a necessary extension of standard welfare economics. The following figures (4.4.a, 4.4.b, 4.4.c and 4.4.d) illustrate the welfare-economic principles subject to an environmental good. *The basis of the figures is an ordinary demand curve for z, EF. A price drop from pz^0 to pz^1 causes the consumer (with constant income) to expand consumption of z from z^0 to z^1. Thus there are two compensated demand functions one through E and one through F, representing utility before and after the price change.*

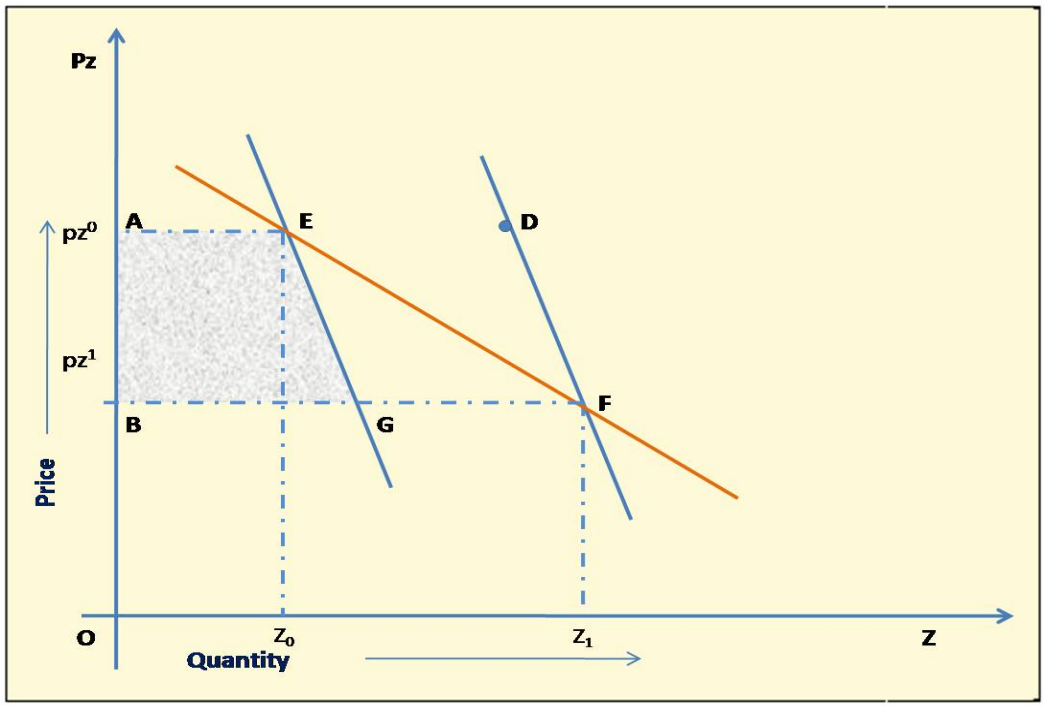

Fig. 4.4.a Compensating Variation from a Price Change

In figure (4.4.a) the shaded area AEGB, to the left of the ordinary demand curve EG is the consumer surplus associated with the price change.

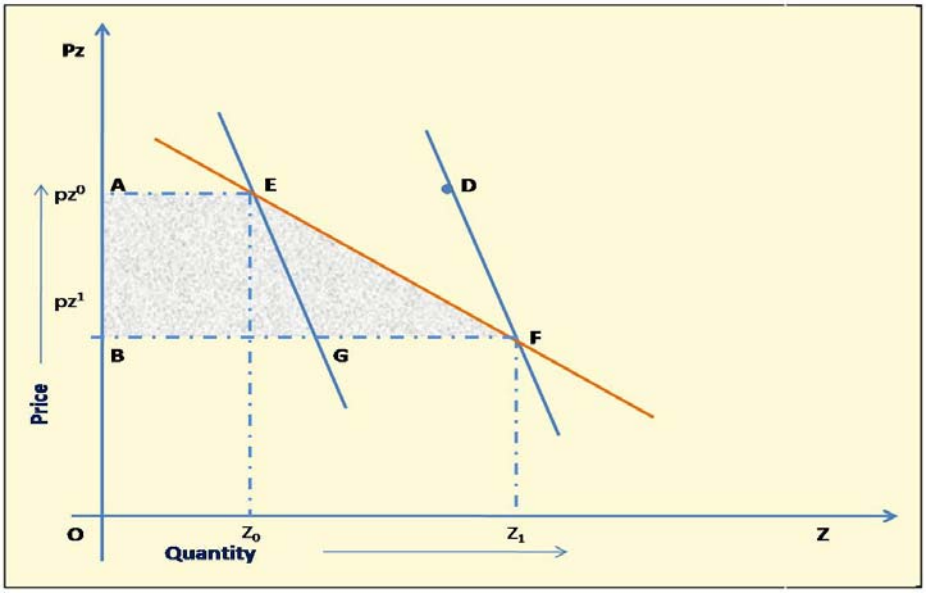

Fig. 4.4.b Consumer Surplus from a Price Change

In figure (4.4.b) the shaded area EGF to the left of the compensated demand curve DF and right to the ordinary demand curve EG is the compensating variation from the price change.

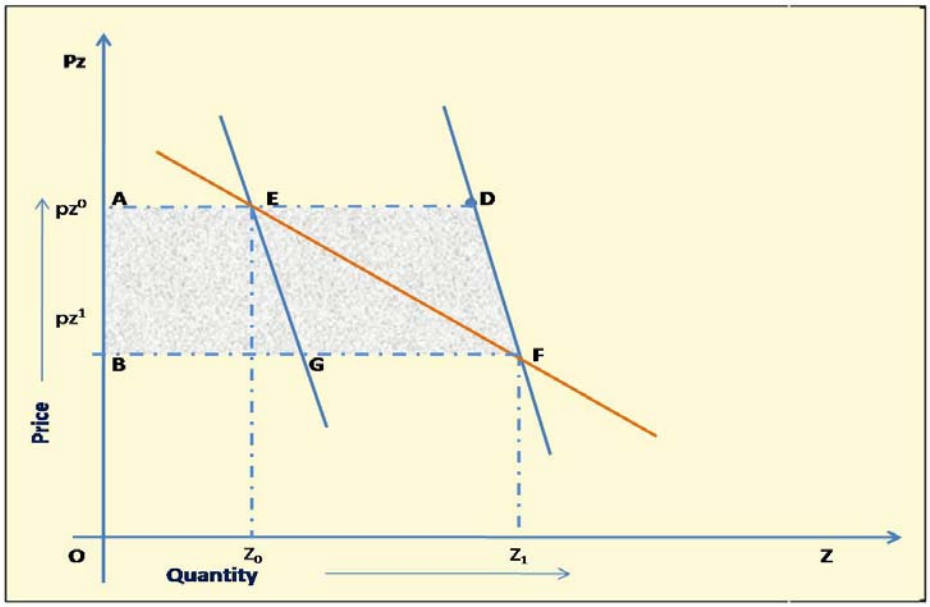

Fig. 4.4.c Equivalent Variation from a Price Change

In figure (4.4.c) area to the left of the compensated demand curve FD is the equivalent variation from the price change.

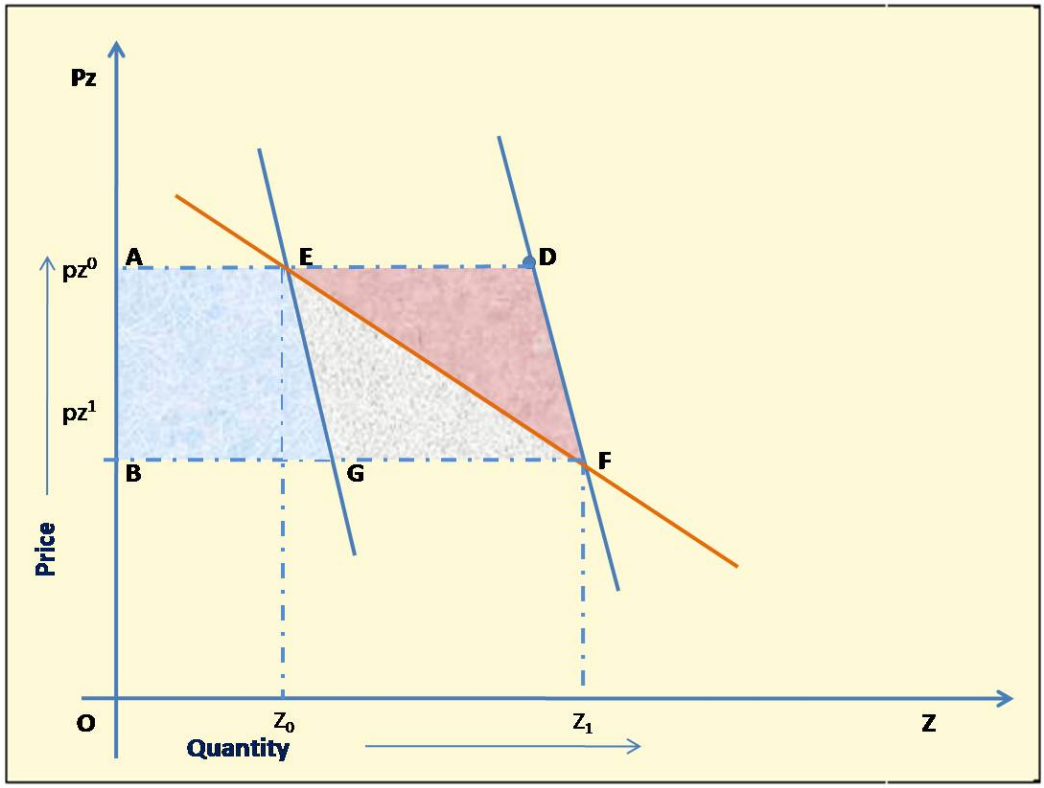

Fig. 4.4.d Superimposition of 4.4.a, 4.4.b and 4.4.c

Figures (4.4.a), (4.4.b) and (4.4.c) are superimposed in figure (4.4.d); it can be seen that the consumer surplus appears to be bounded below and above by the compensating and equivalent variation, and also that the areas are not too different. For small price changes, one need not be concerned with the difference: EV, CV and Consumer surplus are approximately the same. For large price changes, the differences among EV, CV and consumer surplus may be large though not always. Also as is clear from the figure, CV≤ consumer surplus ≤ EV (provided the good is normal) (Kolstad 2006).

It can be concluded thus in the following table 4.2, which elucidates the definitions of CV, CS, EV and ES with a price change.

Table 4.2 Definitions of CV, CS, EV and ES with Price Change

	Compensating Variation/ Consumer Surplus	Equivalent Variation/ Equivalent Surplus
Price fall/ Environmental Improvements	Max. WTP for the change occurring: Amount of money to take away from an individual to keep him/her at the same level of welfare s/he is at without the price decrease/ environmental improvement.	Mini. WTA compensation for the change not occurring: Amount of money to give an individual to bring him/her to the same level of welfare as if the price decreases/environmental improvements had occurred.
Price rise/ Environmental damage	Mini. WTA compensation for the change occurring: Amount of money to give an individual to keep him/her at the same level of welfare s/he is at without the price increase/environmental damage.	Max. WTP to prevent the price increase/environmental damage: Amount of money to take away from an individual to bring him/her to the same level of welfare as if the price increase/environmental damage occurred.
Adapted: *Perman et.al. 1999; Markandya et.al. 2002; Talukdar 2007.*		

4.5.2 The Pitfalls in Environmental Valuation

With their hundreds of pages, tidy tables, colourful figures and glossy covers, economic valuation reports often look most impressive. But are they any good? (Pagiola et.al. 2004).

Apart from the previously mentioned limitations of valuation methods (Table 4.1), it is recognized that the following pitfalls are prominent which misguide all valuation experiences, shifting the non-marketed pivotal, sustainable ecosystem

services to marketed goods and services, with the help of neutralized cultural, ethical and spiritual values.

Most valuation techniques are focused on a particular problem; it may be a water pollution issue, land degradation issue, air pollution issue, and sometimes more focused or minute to health issues, productivity of a particular crop and loss of fisheries etc. Lack of comprehensiveness or partial understanding of ecological issues does not create a right policy-decision as well as *does not accurately represent the full value of ecosystem. They* (valuation methods) *are usually based on a particular person's or group's perception of what a particular ecosystem service is worthwhile at a specific point in time and place* (Emerton and Bose 2004). Thus, the important consideration to bear in mind is that the valuation of ecosystem service is not a stand-alone exercise and that the results of ecosystem valuation studies are not always definitive, exact or transferable between different situations and locations.

Beyond the 'anthropocentric instrumental + intrinsic value' (Turner 1999) (use + non-use value), the 'total value' of an ecosystem also comprises non-anthropocentric instrumental and intrinsic value. The typology and philosophy of environmental valuation literature suggests applying stated preference-methods in non-marketed goods (Smith 1997; Perman et.al. 1999; Sugden 1999; Munro and Hanley 1999; Langford and Bateman 1999; Bateman et. al. 1999; Bateman and Willis 1999; Bonnieux and Rainelli 1999; Loomis 1999; Pearce and Ozdemiröglu 2002; Pagiola et.al. 2004; Emerton and Bose 2004; Bolt et.al. 2005; Wills 2007) to capturing the 'total value' (for an understanding on terminological and philosophical differences, see the next section 'towards eco-centric consensus).

According to Emerton and Bose (2004), stated preference method is one of the only methods that can be applied to option and existence values. Since, it is more reliable than revealed preference methods. However, many pitfalls and biases can

be noticed in the Stated Preference Method. According to Pearce and Ozdemiröglu (2002), WTP and WTA are the two potential issues in Stated Preference Method. They point out fourteen types of biases associated with it (See table.4.3).

Table 4.3 Types of Bias Associated to WTP and WTA in SPM (pp. 130-33)

Type of bias	Nature of bias	Effect on WTP (*t*WTP='true' WTP)	Solutions
Hypothetical	Scenario is not consistent with reality	WTP≠*t*WTP	Design a plausible scenario
Strategic — classic free rider	If respondent believes payment of their WTP will be collected from them	WTP<*t*WTP	Remove outliers. Seek motivations for WTP. Use referendum (yes/no) format
Strategic — free rider	If respondent believes payment will only be collected from others	WTP>*t*WTP	As above. Strategic bias not thought to be serious in practice
Starting point bias	WTP anchored on initial stated value	WTP=initial value≠*t*WTP	Use open ended or payment card techniques
Framing effects	WTP depends on how the question is framed (e.g. whether 'the glass is seen as half full or half empty')	WTP varies with frame when it should be the same for the same good	Possible presentation of questions in a 'neutral frame'

Payment vehicle bias	WTP depends on how the good is to be financed	WTP *for the good alone* should be invariant with payment vehicle	May not be a problem if the good is redefined to include the method of payment. Otherwise, payment vehicle should be as close to the one that would be used in reality
Embedding/ scope insensitivity	WTP does not vary with quantity of good offered, or when first quantity of good is included in a second quantity which has another good as well	WTP may reflect *warm glow*, i.e. satisfaction of paying for the good, not the WTP for the good itself. Could reflect satiation: i.e. having enough of the good	Although there are disputes about whether warm glow is a problem, and about the validity of studies finding warm glow effects, the wording and follow up should be designed to ensure that the full WTP is captured. Satiation is legitimate so not a problem
Sensitivity to sequencing	WTP varies with where in a sequence of goods a particular good appears	WTP$\neq t$WTP?	Sequencing effects may be rational. One would expect lower WTP the later a good appears in the sequence since disposable income will be less given that first sequenced goods have been purchased

Yea saying	Respondent tries to please the interviewer	WTP>*t*WTP	If detected, calibrate responses when analysed by scaling down
Nay saying	Respondent concerned to counter the interviewer	WTP<*t*WTP	As above, but scale up
Protest responses	Refusal to answer, or may give ludicrously high WTP or untrue zero WTP ('protest zeros')	No WTP WTP>*t*WTP WTP<*t*WTP	Ask for reasons for refusal to state WTP (follow up questions). Avoid open ended formats. Omit outliers especially where WTP exceeds income. Examine reasons for zero WTP: many zeros will be legitimate zero bids. Omit 'true' protests
Preference imprecision	Respondent unable to cite precise WTP	There is no *t*WTP but a range. Could reflect underlying randomness of preferences	Record the range (e.g. using a payment ladder). Ranges are not signs of bias but a fact of life Underlying theory is breached, so any resulting WTP could be a construct of the questionnaire

Reference dependency	WTP varies with the reference point as perceived by the respondent	Most likely difference between questions framed as WTA rather than WTP: WTA>WTP	Test for reference dependency by asking both WTP and WTA questions. If there is aversion to money, use CM. WTA more relevant when property rights vested in losers, and WTP when vested in gainers
Information effects	WTP varies with information provided	*t*WTP corresponds to 'right' amount of information?	Not a bias: one would expect WTP to vary with information, as with any market good. All prices are conditional on context
Adapted: *Pearce and Ozdemiröglu 2002*			

Another important pitfall observed is that the valuations techniques assume the consumer/producer (rational individual) as 'well-informed, educated and concerned' about environmental issues. As a rational economic being, consumer is a 'utility maximalist' whereas producer is a profit maximalist'; therefore the economic activity is a utility maximizing exercise. Thus, being more informative or nor-informative about the ecosystem does not create a great shift in 'value' for two reasons viz. 'time' and 'position'. A rational individual is willing to pay (WTP) higher price to get a particular environmental good/service because s/he is more informative and expects a future market, even if the good/service is away from his/her local environment. A rational individual is willing to accept lower price as compensation (WTA) in exchange for a particular environmental good/service because s/he is not informative and/or the particular good might be outside of

his/her local environment. Therefore, time and position of environment goods/bads define the value of ecosystem services, though strategically and ecologically crucial/vital. The highly informed futuristic consumer, purposefully, pays a less price to attain an ecologically fragile ecosystem in an imperfect market. The intention of the consumer is profit maximisation where s/he will turn a producer within the short-run. Here, the bequest value, future use value and vicarious value are minimal to the individual, because he is positioned away from problematic (polluted) ecosystem. Thus, in order to satiate him or herself within his/her shortest life span (relative to the eco-system lifespan), the 'rational individual' grabs and adds more and more 'wealth' to his/her bundle without concern for the ecosystem, which is the base of all wealth. So, monetary transactions alone cannot correctly and reliably measure environmental benefits.

The 'purchasing power' of an individual determines WTP and WTA rather than the quality and quantity of the environmental goods/services that fall in the actual demand and supply schedule. So the greater purchasing power of the buyer and relatively less purchasing power of the seller results in the environmental good/service being valued less than its 'expected real value'. Thus, well-being of the people with equitable distribution of wealth is a pre-requisite for environmental good/service conservation. The growing investments of multi-national corporate companies in poor, under-developed and developing countries magnify the argument and the 'commercialization of natural resources' is becoming a wealth-enhancing item to the local poor, while the former views it as an economic good, least bothered about the deterioration of the local environment. It will take a long time span to bring about the resultant benign effects on the global environment.

The economic valuation proponents are silent on such ethical questions; they are neither detailed on anthropocentric intrinsic value of the environment nor accept the non-anthropocentric instrumental and intrinsic value of nature. These are

ignored within the 'total economic value' derived from unfeasible WTP/WTA logic or from 'less informed' and 'ethically neutral' rational behaviour of an individual. 'Total value' of ecosystem benefits and 'glue value' of ecology, thus considered a philosophical fallacy under environmental economics literature, as Turner (1999) describes, "*is not amenable to quantification*". As O'Neill (1997) ascribes, the valuation methods, with North Wale examples, especially cost-benefit and WTP/WTA, are illusory.

In short, valuing an ecosystem has become futile under 'marginal revolution' and 'monetary reductionism', where the use of valuation techniques will be in the interest of the 'rational individual', those who believe in 'laissez faire' and consumer sovereignty principles, in order to identify and promote new ways of capturing ecosystem values through markets or payment for services.

4.6 TOWARDS AN ECO-CENTRIC CONSENSUS

The taxonomy and philosophy of environmental valuation techniques revolves around anthropocentric worldview. While, the non-anthropocentric values suggest by Turner (1999) doesn't reveal the intrinsic values of ecology in its exact sense. The four separate forms of value in relation to environmental resources are:

1. Anthropocentric Instrumental Value: This is the 'Total Economic Value' = Use + Non-use Value.
2. Anthropocentric Intrinsic Value: This value category is linked to stewardship in a subjectivist sense of the term 'value'. It is culturally dependent.
3. Non-Anthropocentric Instrumental Value: It encompasses the good of collective entities, e.g. ecosystem. But this category may be weak to demand attention as far as humans are concerned.
4. Non -Anthropocentric Intrinsic Values: This is the 'inherent worth' in nature and passive in valuation models as a meta-ethical claim.

Thus, obviously, 'total value of an ecosystem' is the sum of total economic value, anthropocentric intrinsic value (e.g. cultural), non-anthropocentric instrumental value (e.g. glue value) and non-anthropocentric intrinsic value (nature's insurance value). Mathematically, with the help of environmental economics literate and eco-centric perception, it can be stated as:

$$TVE = TEV + AIV + Ec.\ V + Ec.\ IV$$

where

$$TEV = DUV + IUV + OV + QOV$$

$$AIV = AV + BV + EV + VV$$

$$Ec.\ V = C\ V\ Ec. + GV + DB\ Ec.$$

$$Ec.\ IV = IV\ Ec. + AV\ Ec. + EFB$$

Where, TVE - Total Value of Ecosystem; TEV-Total Economic Value (Turner 1999); AIV- Anthropocentric Intrinsic Value (Turner 1999); Ec. V- Ecological instrumental Value (Turner 1999, modified;); Ec. IV – Ecological Intrinsic Value (Turner 1999, modified; McMurtry 2001); DUV – Direct Use Value (Perman et.al.1999); IUV– Indirect Use Value (Perman et.al.1999); OV- Option Value (Perman et.al. 1999; QOV-Quasi-Option Value (Perman et.al. 1999); AV-Altruistic Value (Kolstad 2006); BV- Bequest Value (Banerjee 2001; Kolstad 2006); EV-Existence Value (Perman et.al. 1999; Banerjee 2001); VV- Vicarious Value (Banerjee 2001); CVE- Current Value of Ecology; GV- Glue Value (Turner 1999); DBE –Direct Benefit from Ecology; IV Ec. – Insurance Value of Ecology (Turner 1999); AV Ec. –Aesthetic Value of Ecology (Panagopoulos 2009) ; EFB- Expected Future Benefits.

Here, 'Ecology' is a strict non- anthropocentric terminology, which conflicts with economic/marketed environmental value. Ecological philosophies examine 'total value of environment' as an anthropocentric market conclusion whereas 'total value of ecology' is non-anthropocentric in nature. Thus, since now, the eco-centric consensus deals with 'total value of ecosystem', the role and significance as

well as the future scope of ecology cannot be underestimated. Economic well-being and ecosystem sustainability ought to be the fundamental goals of any economic activity.

4.6.1 Need for Eco-centric Consensus

In 'egocentric[35] market mechanism', it is believed that individuals are only concerned with their personal pleasure and consumption, by revealing his/her preferences for a marketed good in terms of money. Since many environmental benefits are non-marketed, there is, thus, a market failure occurring. Fundamentally, this reflects in lack of well-property rights, improper and excessive (non-optimal) extraction of resources and industrial emissions etc., thus minimising the role of market as a source of information that helps the individuals to choose their own pleasure. The widespread dumping of industrial effluents with their direct health impacts and decreasing quality and quantity of environmental services has demanded the attention of environmental economics in terms of an environmental cost-benefit analysis for a just allocation of resources among various human wants and the orientation towards environmental quality assurance and reduction of pollution. The Coasian measures and Piguvian taxes are the end results of this 'neo-classical' or 'egocentric' environmental economics.

Coase assumed markets to be perfectly competitive, which means that the market prices accurately reveal the individual utility (Cole 1999). On 'property rights', one of the basis for environmental economics theory, Coase's conclusion is that *under some conditions, it makes no difference to efficiency whether the polluter has a right to pollute or the victim has a right to clean air (although it will make a great deal of difference to each of the two parties). Since the right to pollute is a property right that has value if trade is allowed in those rights, efficiency should prevail, no matter how they were initially allocated. If the right is worth more to the victim than the polluter, the victim will end up with the right, no matter how it was initially distributed. Of course, the initial distribution of rights does matter*

to question of equity. Rights can be valuable. Vesting someone with a right is like giving them money and resources (Kolstad 2006). Hence, the most significant condition in the Coase theorem is probably the zero transaction costs with the following assumptions i) everyone has perfect information; ii) consumers or producers are price-takers; iii) there is a costless court system for enforcing agreements; vi) producers maximise profit and consumers maximise utility and v) there are no income or wealth effects (Callan and Thomas 2000). While, the Pigovian fees or Pigovian tax asserts the social cost (in general economic sense) of pollution is in excess of the private cost to the polluter, the government should intervene with a tax, making pollution more costly to the polluter. If the pollution is more costly to produce, the polluter will produce less pollution.

Literature on environmental economics, as a mainstream discipline, has been enriched by externality[36] theories, shadow pricing[37] for pollutants, emission taxes[38]-standard price approach, public good allocation theories, social welfare[39] theories- Pareto optimality, Lindahl solution, cost-benefit analysis, social choice theories, policy instruments like moral suasion, government financing and subsidies, environmental regulatory approaches, pollution licences, opportunity cost principles, polluter pay principle, principle of interdependence and a number of principles, theories and economic solutions. And these (pollution-related measures) can be categorised into 'Price-based measures' and 'Rights-based measures'; former internalising environmental costs and benefits through user fees, charges and taxes, while latter creating rights to use environmental resources, or to pollute environment, up to a pre-determined limit, and allow these rights to be traded (Commonwealth 1990, c.f. Beder 2007). While it is assumed that economic instruments are efficient than legislative instruments (Beder 2007) however the environmental economic principles do seek government regulations or interventions to curb the negative externalities of industrial production and consumption of environmental goods and services.

The environmental economics paradigm, environmental valuation methods and techniques, and environmental regulatory measures have some common features derived from the above discussion which can be concluded as follows:

1. The entire pedagogy is anthropocentric- environment serving man first,
2. Utilitarianism is the general philosophy- maximisation of pleasure from consumption,
3. Environment is simplified as an input in industrial production,
4. Willingness to pay (or purchasing power) of the individual can give rise to any type of pollution practices,
5. Intrinsic values of humans and ecosystem as well as instrumental value of ecology cannot over rule market value due to its quantification constraint
6. Rational individual governs economic activities- utility and profit maximisation
7. Subjective (non-economic) factors like social status of individual, culture, traditional values, geographical and climatic constrains and ecological significance of resources have no place in valuation techniques,
8. Efficiency and optimality in production, consumption and distribution and allocation of resources is the focal point, rather than sustainability of ecosystem,
9. Surplus is the welfare measure, that anyone can attain through a corrupted market
10. Free flow of goods and services through market mechanism is promoted,
11. Ecological ethics has been diluted as survival philosophy
12. Inadequate interactions with other subjects like ecology, geology and environmental engineering has marked environmental economics pedagogy as lifeless science; positivism alone doesn't make sense.

Thus, the discussion in present study focuses on eco-centric arguments without meaning to limit the scope of ego-centrism. In other words, it assumes *ethics*[40] *as*

the soul of economics. Economics without ethics inevitably becomes an economics of greed and avarice. Unfortunately, in the mainstream neo-classical economists' effort to "elevate" economics into a science, economists have adopted a reductionist approach like other sciences that divorces it from ethics. This ethically neutralised economics which became the foundation of a materialist civilization of infinite growth fuelled by money culture and market mechanism. Removing ethics from economics also removes social responsibility and critical awareness so that a 'well-informed, educated person' of environmental economics becomes passive towards in environmental issues. They are left only with consumption and materialism, which is an *obligation to enforce and fulfil contractual undertakings* (Peacock 1997) disconnecting the functional relationship of the heart (the subjective preferences) from the head (the objective-standard preferences).

'King Darius survey' (Herodotus) can make it clear:

When Darious was king of the Persian Empire, he summoned the Greeks who were at his court and asked them how much money it would take for them to eat the corpses of their fathers. They responded they would not do it for any price. Afterwards, Darios summoned some Indians called kallatiai who do eat their parents and asked in the presence of the Greeks ... for what price they would agree to cremate their dead fathers. They cried out loudly and told him to keep still (c.f. O'Neill 1997).

As O'Neill (1997) interprets, *one exhibits commitment to some good, here one's dead kin, by refusing to place a price upon it. One betrays that commitment by accepting a price. Correspondingly, asking persons how much they would be willing to pay to forgo a good to which they are committed is to attempt to corrupt.* Darius does not act like the modern neo-classical economist, when faced with 'protest bids'. Rather he uses protest responses to the demand for a price

precisely to discover what the basic commitments of a society are. But the neo-classical environmental valuation, policies and regulations implement the WTA principle to Aborigines in Kakadu Conservation Zone in Australia; New Zealand's modern democratic government to its ethnic people; the Spaniards and the American Whites to Red-Indians of America, extending to African and Latin American countries in its materialized and institutionalised forms like the modern development theories and practices which is guided and controlled by the western ethics that Mehmet (1995) calls " Westernizing the Third World".

The environment is a place of conflict, between competing values and interests, and institutions and communities that articulate those values and interests (O'Neill 1997); because, certain things are intrinsically un-commodifiable and should remain outside the cash nexus (Peacock 1997). The conflicts over natural resources, especially water and land, are growing worldwide. The ethically, culturally strong ethnic societies and the economically deprived peoples are facing greater threat under 'utilitarianism', the humanist moral philosophy. In theory, rights (Deontology) and duties are accorded exclusively to *human beings* either as individuals or as communities. But the practical utilitarianism, what the positivist economists do, possesses and works on three components:

1. Individual behaviour should be directed to producing the greatest amount of good for all persons in the aggregate.
2. Individual's pleasure or happiness as well as well-being or welfare (social good) should be the basic criterion.
3. The principle that individual good or well-being is comparable over persons and time (Perman et.al. 1999).

Applied utilitarianism through 'laissez faire' markets limits social-good criterion into 'egoism' that dominates as my, my family, my people and my community ignoring other beings in practical life. Utilitarianism seldom takes into account the

linkages of natural beings to human well-being. While, the naturalist ethics denies this exclusiveness to human beings and asserts *rights can be defined only with respect to some natural system, including living and non-living components* (Perman et.al. 1999). The *eco-centric thinkers are opposed to the trite simplicity of environmental economics and the myopic thinking of ego-centric theories; they are concerned with ecology, the science of the relations of living organisms to the external world, their habitat, customs, energies, parasites etc*. (Worster 1985 c.f. Cole 1999).

Curry (2006) has analysed the literature of ethics and identified three schools of thoughts viz. Virtue ethics, Deontology and Utilitarianism on the basis of *secular ethics.* The environmental economists and the neo classical economists deny the 'spiritual values' and 'religious ethics', whereas 'secular ethics' is the expansion of humanism - man's 'affection', 'sympathy' and 'oneness' feelings to his surroundings. Therefore, while value arguments in environmental economics are noted as 'shallow green', ecological economics extends values to more eco-centric, 'dark green' ethics. Curry (2006) observes four degrees of 'green-understandings' in economics:

1. Light (Shallow) Green Ethics: This is anthropocentric ethics, limiting direct value to human beings. Non-human beings of any kind have no independent moral status and only merit consideration insofar as they matter to humans. E.g. mainstream neo-classical economics.

2. Mid (Intermediate) Green Ethics: light non-anthropocentric but not fully eco-centric. Humans alone have any intrinsic value. Natural items have some intrinsic value, but wherever they conflict with human interest the latter must take precedence. E.g. environmental economics and economic analysis on wildlife protection and wilderness preservation.

3. Dark (Deep) Green Ethics: it is eco-centric or bio-centrism ethics but does not extend much respect to reverence of nature (so called 'secular respect'). It is non-anthropocentric and is able to recognize the value and therefore support the ethical defence of the integrity of species and of ecosystem as well as human and non-human organisms; *nature as value* must allow for conflicts between the interests of human and non-human nature and occasionally allow human to lose their interests. E.g. ecological economics, eco-feminism etc.

4. Post-Secular Green Ethics: It evolves from the short comings of 'secular respect' which is much weaker and therefore potentially less effective. It tries to restate the dimensions of emotion and spirituality within secular frame work. Spirituality is free from religion, and is explained as: "the call for a 'resacralization' of nature as a necessary condition for the solution of global and local environmental problems has much to recommend it in so far as it emphasizes the local, the timely, and particular. Nevertheless, in so far as such a move grounds environmentalism in 'Nature' conceived as an alternative absolute, it is misguided and dangerous for all the reasons that such claims to transcendent knowledge always are (c.f. Curry 2006).

This spirituality can check the process of modern economic growth and makes clear what is right and wrong, which flowing from the individual's innate feeling of unity with "existence," encompassing humanity, nature, and divinity. All this propels the individual to act in a humane way with a deep sense of responsibility for his/her actions and of stewardship toward the needs and rights of others and other beings. This gives great significance to the efforts of communities all over the world that are struggling to restore ethics to their economic practice, to become critically aware and socially responsible for the ways in which they organize, use, consume, and manage their resources. They advance the practice of voluntary simplicity, creating livelihoods for the unemployed, adopting

alternative ways of producing and distributing goods and services to reduce resource use, recycling waste into reusable resources, undertaking sustainable agricultural practices, and providing credit for the poor. Otherwise, the market system should be left alone, with no government control, to allocate goods and services. Let the rich get richer and let it the trickle down to fix the poor.

It is very clear that in the present market driven 'development-ism' and 'growth-ism', none of these extremes (the 'egocentrism' and 'post secular deep green') works. Therefore, the current ecological scenario requires '*paradigm co-existence'* (Söderbaum 2000) rather than paradigm shift, what Odom (1994) calls 'interface of ecology and economics'; it needs to be enriched with the right blend of 'deep green spirituality' and 'shallow green ethics'. Even so, the pedagogy of 'man's ordinary business life' seems isolated from the basic positive sciences thus misguiding the economics paradigm till the emergence of ecological economics. Here, the courageous visionaries, social activists, community leaders, and concerned individuals engaged in this historic process are demonstrating the possibility of creating economic cultures in which our economic lives become a part of our ethical and spiritual practice. In our present context, it is a profoundly revolutionary act. Therefore, the consensus elucidates the balance blend of eco-centrism and ego-centrism, called 'radical socio-centrism'.

4.7 ECOLOGICAL ECONOMICS: THE LINE OF RADICAL SOCIO-CENTRISM

How much is a songbird worth? … For even when we argue for something that is beyond ordinary value, we still seem to find ourselves required to quantify its worth, and to engage in conceptual haggling over a price for its existence. Valuing the songbird thus epitomizes the problems of developing and applying ecological economics as a means to rational and effective decision-making for the environment (Funtowicz and Ravetz 1994).

Ecological Economics is a relatively recent discipline with emerging academic interest, *initiated by well- renowned ecologists and economists like Herman Daly, Ann Mari Jansson, Robert Costanza and Joan Martinez-Alier* (Ropke 2004). It started as a critique to main stream neo-classical and environmental economic models, policies, rules and principles that stood disconnected from ecology and its sustainability. According to Georgescu-Rogen (c.f. Christensen 1989), the *mechanistic sins of modern economics (Marxian and Neo-classical) can be traced to the Ricardian concept of land "which is expressly defined as a factor immune to any qualitative change (which) we could refer to simply as space".* He observes that the impact of basic physical principles - the material and energy use in economic production, price-system and longer run growth processes and prospects – has been conveniently ignored (Christensen 1989).

The subject matter of Ecological Economics (EE) is the "relationship between ecosystems and economic systems in the broadest sense" and is complex. Inspired by the laws of thermodynamics, especially the first and second laws, respectively the law of conservation of mass/energy and the so-called 'entropy law', ecologists described the ecosystem process in terms of flows of energy and matter. An associated expansion took place among some economists, enlightened by thermodynamics, and emphasized that the society could be seen as an "organism" with a "social metabolism" (Ropke 2005). To ensure socio-economic well-being and sustainability to the 'human being' is the prime objective of all disciplines, which can co-exist only with the sustainability of the 'non-human being' i.e. nature. In order to study this relationship in a constructive way several facets have to be taken into account, including biological, physical, chemical, economic, political, social, cultural as well as ethical considerations. Thus, *the analysis of the relationship between the economic and the natural system requires the cooperation of many scientific disciplines, which is generally called 'interdisciplinary'* (Baumgartner et.al. 2008) in ecological economics.

While, sustainability is the subject matter of ecologists as well as economists, it is essentially a descriptive and normative ethics. Such sustainability ethics encompasses at least three aspects: The moral relationship between humans and (i) other currently living humans, (ii) future generations of humans, and (iii) current and future non-human nature. *The science and management of sustainability therefore requires a reference to valuations in society (descriptive ethics) and to moral philosophy (normative ethics). One particular challenge of trans-disciplinary EE is how to include, and how to deal with, the complex ethical issues raised by the imperative of sustainability* (Baumgartner et.al. 2008). One of the major challenges of ecological economics has been *to understand and examine the design of environmental policies and governance institutions. Institutional economics in all its guises has been an influential source of ideas for ecological economics* (Paavola and Adger 2005).

Interestingly, these complex challenges and the manner of interaction between ecologists and economists was institutionalized with the establishment of the International Society for Ecological Economics in 1988 (first conference 1990) and the Journal Ecological Economics (first issue1989) (Ropke 2004). Ecological economics has turned to institutional economics for sophisticated models and understanding of human behavior (So¨derbaum, 2000). Thus, Paavola and Adger (2005) argue for institutional ecological economics as being a promising cross-over between a new institutional economics and ecological economics. According to them "*the learning process involved in making the crossover real would assist ecological economics to take us further towards sustainable solutions for persistent ecological problems"*.

As a growing paradigm and very diverse contributions from ecologists economists and pure scientists, recent years have seen some discussion on the characteristics and delimitation of ecological economics: Is ecological economics a trans-discipline; a new paradigm; something different from environmental economics

or, rather, a part of environmental economics; open for anything with a relation to the environment; or something better defined? (Turner et.al.1996; Turner 1999; van den Bergh 2001; Costanza and Farber 2002; Costanza 2008; So¨derbaum 2000). The question can also be posed in a more normative way: In which direction should ecological economics be developed in future? (Ropke 2005). Answers to these questions are vital when the 'ecological economics paradigm' is taken as a trans-disciplinary policy option for sustainable ecosystem. According to Costanza (2008), one of the authoritative founders of ecological economics:

"Ecological economics is a growing trans-disciplinary field that aims to improve and expand economic theory to integrate the earth's natural systems, human values and human health and well-being. Ecological economics takes a broader perspective and recognizes that there are more things that contribute to human well-being than just the amount of stuff, such as health and education (human capital), friends and family (social capital) and the contribution of the earth and its biological and physical systems (natural capital). Its goal is to develop a deeper scientific understanding of the complex linkages between human and natural systems, and to use that understanding to develop effective policies that will lead to a world which is ecologically sustainable, has a fair distribution of resources (both between groups and generations of humans and between humans and other species), and efficiently allocates scarce resources including "natural" and "social" capital".

The conceptual, practical and philosophical differences between Ecological Economics and Traditional Environmental Economics have evolved and shaped from various works of ecological economists like Daly, Georgescu-Rogen, Odum, Costanza, Martinez-Alier, Norgaard, Ann Mari Jansson, O'Neill, Munasinghe, Christensen and Cleveland. van den Bergh succinctly summarizes these differences as seen in Table 4.4.

Table 4.4 Conceptual, Practical and Philosophical Differences of Ecological Economics and Traditional Environmental Economics

Ecological Economics	—	Traditional Environmental Economics
Optimal Scale	A	Optimal allocation and scale of return
Priority to sustainability	B	Priority to efficiency
Needs fulfilled and equitable distribution	C	Optimal welfare or Pareto optimality
Sustainable development, globally and North/South	D	Sustainable Growth in abstract models
Growth pessimism and difficult choices	E	Growth optimism and win-win options
Unpredictable co-evolution	F	Deterministic optimisation of inter-temporal welfare
Long term focus	G	Short to medium term focus
Complete, integrative and descriptive	H	Partial, mono-disciplinary and analytical
Concrete and specific	I	Abstract and general
Physical and biological indicators	J	Monetary indicators
Systems analysis	K	External costs and economic valuation
Multidimensional evaluation	L	Cost-benefit analysis
Integrated models with cause-effect relationships	M	Applied general equilibrium models with external costs
Bounded individual rationality	N	Maximisation of utility or profit
Local communities	O	Global market and isolated individuals
Environmental ethics	P	Utilitarianism and functionalism
Source: *van den Bergh 2000*		

The present study attends to ecological economics and is convinced of trans-disciplinary nature. It observes that, ecological economics is the outcome of supplementary and complimentary intellectual discourse of experts, scientists and social scientists such as economists, historians, natural philosophers, biologists, bio-chemists, meteorologists, geologists, mathematicians, physicists, psychologists, ecologists, biophysicists, marine biologists, geo-politicians, systematic botanists, industrial and manufacturing chemists, chemical engineers, agronomists, geophysicists, cartographers, seismologists, volcanologists, structural geologists, oil geologists, mineralogists, metallurgists, anthropologists, ethnologists, comparative anatomists, archaeologists, ethno-biologists, sociologists, dialectologists, folklorists and so on. This wide intellectual spectrum and co-ordination (interface) is acknowledged as promoting Ecological Economics as the *science of sustainable future*.

So far as co-ordination and its connectivity to other disciplines and practicability of modeling are concerned, there are merits as well as the drawbacks of ecological economics. Consider the "valuation methods" and "sustainability goal" of ecological economics, which accounts for energy as value. The development of energy approach to economic valuation starts with, as Christensen (2001) observes, *scientifically informed characterization of production inputs and processes. This would be based on an ecological characterization of flows of materials, energy and information, and the technologies, organization and learning skills that transform and convert materials and energy and information…* (subsequently on) *an accurate representation of the distinct differences, constraints and productive potential of the biological and ecologically based "sectors" of nature's economy versus the technologically constructed sectors of human industrial activity which are currently dependent on the entropic* (second law of thermodynamics) *use of vast supplies of inorganic minerals and fossil fuels*. Since, ecosystems are open systems with respect to energy flow (first law of thermodynamics: energy can neither be created nor destroyed, only converted

from one form to another), the energy input into all ecological processes are equal to the energy output from those processes. But, economic systems are open systems drawing on natural resources from the environment and depositing pollutants and waste heat back into the environment (Ayres 1998) thus negating the first law and the Materials Balance Principle (c.f. Patterson 1998) that *mass inputs and outputs into ecological and economic processes must always be conserved.* Costanza (1989) points out that the ecology requires large quantity of solar energy to drive the bio-geo-chemical cycles, with negligible inputs of other forms of energy or mass. *This solar energy is eventually degraded in accordance with the Second Law of Thermodynamics and is radiated as an output from the biosphere in the form of far-infrared energy* (Patterson 1998).

According to Costanza (2008), *ecological economics reminds us that "sustainability" is a multi-faceted goal by focusing on the complex interrelationship between different elements of sustainability: ecological, social and economic sustainability…* and *ecological economics is concerned with the problem of assuring sustainability in the face of uncertainty, and aims to maintain the resilience of ecological and socioeconomic systems by conserving and investing in natural, social and human assets*. The ecological economic pedagogy has defined sustainability on the basis "economic capital" and "natural capital" and is demarcated as weak sustainability and strong sustainability. Here, 'economic capital' comprises machines, land, labour and knowledge and 'natural capital' covers resources, environment and nature. *Under weak sustainability one strives for maintaining "total capital", defined as the "sum" of both types of capital. This allows the substitution of natural capital by economic capital, as has been analysed in economic growth theory* (van den Bergh 2000). Strong sustainability, by contrast, requires that every type of capital (viz. economic, natural, human and social) is maintained separately while the former is the basic concern of neo-classical environmental economics, the latter is the result of ecological economic studies that give relatively more attention to the sensitivity of ecosystems at micro

level; *whereas resource economics extends economic growth theory with environmental variables, emphasizing determinism and approximate long-term trends in a macro-approach that lacks any micro-detail* (van den Bergh 2000).

Moreover, economic efficiency and externality issues have been covered by ecological economics with respect to policy frames (or strong decision making). In the short run, it may decrease the momentum of economic growth, which is noted as 'growth pessimism and difficult choices' in the literature. But ecological economics re-checks the opportunities of 'economic-growth models' and reconciles those with 'relational ontology' (what really *is:* are relations and processes). Therefore, 'economic growth rate' over 'rotational rate of biogeochemical cycles of ecosystems' is unstable and unsustainable.

According to van den Bergh (2000), this growth debate can be characterised by three main questions: Is economic growth desirable? Is it feasible? And, is it controllable? The ecological economists argue that *continuous economic growth is neither feasible nor a desirable option*. *Technological innovation is less important than the capacity of ecological processes to adapt, and that the focus of policy should be technological and institutional measures to reduce the 'throughput' of matter and energy from the environment into the economy and back out into the environment. If such switches are not made then they argue that nature itself will force such changes via an under-supply of food, energy or materials and an increasingly polluted and unstable environment* (Turner et.al. 1996). An 'economic growth'-oriented resource extraction, in the long-run, causes an 'ecological debt' ultimately becoming unmanageable and collapsing the system. For instance, *the damage from Mississippi River floods is man-made, a good part of it because of all the dikes that have been put up along the River* (Odum 1994). Because, the "house of man" is not a closed system as economic models suppose; it is dependent, correlated, and always interacting with the "house of nature".

In short, the primary purpose of an interface is to educate each other. Ecological economics seeks to learn from every discipline about what it thinks and what it proposes to overcome the shortcomings of this materialistic life and its consequences; it may be a value question, may be a sustainability question, or may be a growth question; because economists or ecologists alone cannot arrive at a sustainability conclusion. Ecological economics is such an interface with the hope that it will be practical and will ensure a common sustainable future.

4.8 NEEM: THE CONCEPTUAL FRAME

While the present study claims features of ecological economics, it does not fulfil the ecological economics criteria due to lack of expert arguments to substantiate the cases. Thus, in order to overcome this drawback, the study submits a new concept of New Ecological Economic Model (NEEM) that is exclusively designed to analyse the rural agrarian ecology with pentagon-constructs. Here, radical socio-centrism works an underlying philosophy or ideology that *economics is moving from a strict adherence to the holy trinity-rationality, selfishness and equilibrium* (Colander et. al. 2003) to more rational, ethically and ecologically right purposeful behaviour and sustainability-conscious political identity. The aim of NEEM is the management of ecosystem rather than its valuation.

The study identifies at least three broad goals as being important to managing economic systems within the context of the planet's ecological life support system (Costanza (2001):

1. Assessing and ensuring that the scale or magnitude of human activities within the bio-sphere is ecologically sustainable.

2. Distributing resources and property rights fairly, both within the current generation of humans, between future generations, and between humans and other species.

3. Efficiently allocating resources, as constrained and defined by the two goals above, including both marketed and non-marketed resources, especially ecosystem services.

NEEM considers these three basic goals and evaluates them under the pentagon-construct viz. Philosophical Construct (PC), Ecological Construct (Eco.C), Social Construct (SC), Economic Construct (EC) and Institutional Construct (IC).

4.8.1 The Philosophical Construct

Basically, Economics and Ecology shares similar philosophy- "survival of the fittest" in general – though mainstream economists deny the argument. The ecological system is discarded as foregone species of plants or animals having no 'adaptive capacity' with the environment. Similarly, economic system can exclude one person from the market who has relatively less purchasing power. In brief, there is no equal right to survive either in the ecological system or in the economic system. But, economic philosophy, in particular, proposes equal distribution of wealth, opportunities among people and special care of the 'deprived'. "Economics is the logic of rational action" that places humankind over other beings and this 'logic' or 'rational action' requires a newer dimension than what economists, particularly neo-classists and modern economists imply. Particularly, zoo-centrism, eco-centrism or bio-centrism and deep ecology along with 'alternative economic paradigm' are applicable in the new philosophical construct, without undermining the anthropocentric world view from the ecosystem (or economic system) assessment. It is recognised that humankind is the apex institution in the ecosystem logically and realistically and has the 'right to govern' the system entirely. According to Habermas (1971) "*only if men could communicate without compulsion and each could recognise himself in the other, could mankind possibly recognise nature as another subject: not, as idealism would have it, as its Other, but as a subject of which mankind itself is the Other.*"

4.8.2 The Ecological Construct

Ecology is a self-evolving entity that extends adaptive and absorptive capabilities to the living beings and environmental domains. It is the sole entity that converts solar energy into other biotic products and re-uses and re-cycles wastes with symbiotic relationships. The ecological construct concerns ecology as a universal set and other entities as the subset of ecology. As stated by the law of thermodynamics, "energy can neither be created nor destroyed; it can only be converted from one form to another". Ecosystem is the only system which follows this law without producing unconvertible energy (waste). Similar to the philosophical construct that "humankind has the right to govern the system entirely", the ecological construct also provide three basic governance principles - ecological rights, sustainability and precautionary (Beder, 2007). These are the prerequisite of "re-generative ecosystem" and "ecological succession". The understanding of ecological construct is that supply of natural resources are limited in the short run to maintain the unlimited wants of present subsets; in the long run the ecosystem cannot meet these wants because of the expected intergenerational wants also. Therefore, just for the sake of existence, subsets of ecosystem have to take into consideration the limitations of ecology that are very much linked to unlimited wants.

4.8.3 The Social Construct

Man (in its genderless meaning) is a social animal in so far as zoo-centrism is concerned. Society is the only one system that can manage all members of the ecosystem with human logic and rational action. Self-interests, as central entity, will not promote well-being among individuals and societies globally. Humankind, who is ethically right, ecologically vigilant, socially conscious, ideologically correct and psychologically passionate as well as harmonious among economic-ecological activities, need to be responsive to the prospects of intergenerational resource distribution. Man should neither be a free rider nor be

a sheer exploiter of ecosystem. Rather as a governor of the ecosystem, human beings must maintain societal and ecological contact and social co-ordination among the present population, other beings and future generation. In its absence, unethical consumerist self-interests and unplanned economic (industrial as well as agricultural) actions followed by ecological disasters signals that "dinosaurs end" is close to humankind along with the collapse of the entire system. Therefore the social construct focuses on the 'right mindful people' based on three principles - equity, participation and human rights (Beder, 2007) - for the right socio-economic system management.

4.8.4 The Economic Construct

The above discussed scratches point out that economics is a science of self; utility maximising consumer, profit maximising producer, wealth-increasing individual and growth-aiming nation states; where pedagogy itself is an end of human-centred logic and rational action. The new economic construct is an attempt to evaluate the ethical quality of economic activity in two ways: effects of economic activity on individual consumer, on society and on ecology and secondly, the kind of desire at the root of any economic action. In the case of pricing and valuation, the new construct takes commodities' ability to meet the need for well-being. Unfortunately, the present economic pricing methods project an artificial value created by self interests. It is a commodity's capacity to satisfy the desire for pleasure. Thus, there are two types of consumption: "right" consumption and "wrong" consumption; the former is ethically, ecologically, economically just and the latter is market-oriented consumption. Right consumption is the use of goods and services to satisfy the desire for true well-being. It is consumption with a goal and a purpose (Payutto, 1994). Considerably, the new economic construct is a realization of true well-being and right consumption that does not harm oneself or others. In short, the new construct of economics is neither a production-based supply-push economics nor a consumption-based demand-pull economics; it is

simply the right economics for right well-being guided by promised need-based consumption. Here economics moves towards a '*more eclectic position of purposeful behaviour, enlightened self-interest and sustainability'* (Colander et.al, 2003).

4.8.5 The Institutional Construct

'Institution', though a misguiding terminology, expresses a meaning of a group of individuals' establishment for a common cause. It may be a family, class or clan entity, political or social entity or nation state- an institution at the macro level. Ecological succession is also a product of institutional behaviour that starts from microbial bacteria's institutional actions and progressing through the participation of complex organisms that are symbiotically organised for a common cause which is survival. Obviously, all living beings in the ecology are interrelated to each other, mutually or symbiotically. This can be called an institution since there is a shared common feature, common environment, growing and reproducing within the system. As a single being it is difficult to survive without sharing commons- water, air, soil and energy. The new institutional construct considers the whole ecosystem as an institution without brushing aside the functions and role of micro institutions like human being, vegetation, animals, birds, micro organisms, marine species, earth-worms, reptiles and abiotic substance. It positively seeks a harmonious existence among all institutions with their capability to regenerate and restore the ecological functions. The institution of human beings, as an apex entity with logic and rational capabilities, has to lead and propagate the regenerating process of the ecosystem in more sustainable ways. Before getting into the present ecological and economic issues and crafting and defining a better future, the human institution has to go through a structural economic change that ought to be answering the following questions.

1. How do we become more mindful of our actions and its impact?
2. How do we change the way we live?

3. Do we need to accumulate so much wealth?
4. How much is enough?
5. Is there a realistic middle path? If so, how do we define it? How do we live it?
6. What is our responsibility towards influencing the future well-being of our species, of our planet and all its life forms?

Institutions of other beings are not answerable to these questions, because they are symbiotically linked to each other and enjoy a horizontal / parallel 'progress' or existence along with the ecosystem.

END NOTES

[1] A connection between different parts of the economy.

[2] Marginal Cost of Production plus the marginal external cost of dumping effluent.

[3] It means, the aggregate money expenditure incurred by a firm on the various items entering into the production of a commodity.

[4] According to Marshall, the real cost of production is expressed not only in money but in efforts (of workers) and scarifies (of capitalists) undergone in the making of a commodity.

[5] The opportunity cost of production of a commodity is the commodity that is sacrificed in producing it.

[6] According to L.M. Fraser, "Land stands for all natural resources which yields an income or exchange value.

[7] According to S.E. Thomas, "Labour consists of all human efforts of body or of mind which are undertaken with the expectation of reward.

[8] Capital is a produced factor of production insofar as it is made and created by man himself.

[9] Organization combines the different factors of production, in the right proportion and initiates the process of production and also bears the risk involved in it.

[10] Nobody can be excluded from its consumption, nor can consumers be forced to pay for their benefit.

[11] Its consumption is collective and all consumers are supplied with it jointly.

[12] A larger consumption of public good by some does not affect the share of others, nor is their satisfaction level affected.

[13] If number of consumers increases, cost of supply of a public good does not increase.

[14] Pareto Criterion of welfare.

[15] Having regard to implied and actual values, the chosen trade-off between production and conservation is achieved at least cost so that no reassignment of property rights would improve production or biodiversity objectives without making some one worse off.

[16] The amount of other good which has to be forgone because resources are used to make some particular good. When goods or services are produced, the resources used to make them are not available for other purposes.

[17] If a consumer prefers A to B and B to C, he must prefer A to C or, if he treats A=B and B=C, he must treat A=C.

[18] If a consumer prefers A to B in one period, he must not prefer B to A in another period.

[19] The consumer has not reached the point of saturation in case of any commodity and he is not over-supplied with goods in question. Therefore, a consumer always prefers a larger quantity of all goods.

[20] A view often put forward is that 'economics is about money'. It is about how to make money or profit. All kinds of socio-economic-cultural impact are reduced to money-based conclusions.

[21] Excess benefit that an individual gains from an economic activity; it might be higher than profit or utility.

[22] As demand for a resource grew, either cumulatively for nonrenewable resources or at a given point in time for renewable resources, lower-quality deposits had to be developed. Lower-quality deposits, whether a ton of copper or a bushel of wheat, required more labor per unit extracted. Since the labor time needed to extract resources from the lowest-quality deposit set their price, using lower-quality deposits raised the price of natural resources. Conversely, when demand subsided, the lowest-quality deposits no longer were used, less labor was required to produce resources from the lowest-quality deposit, and the price of natural resources declined.

[23] Among a nation of hunters, if it usually costs twice the labor to kill a beaver which it does to kill a deer, one beaver should exchange for or be worth two deer.

[24] The environment cannot be regenerated in a factory according to our wish and will. For the environment's regenerative and assimilative capacity one has to rely on the speed of nature's process. As we draw more and more resources from and dump more and more waste into the environment the entropy increases. Thus the decision to use up environmental goods or services is irreversible.

[25] Uncertainty arises from our limited knowledge of the ecological balance. If we use up some environmental goods we really don't know what else we are likely to lose in future.

[26] Use value arises from the actual and/ planned use of the service by an individual.

[27] Existence value arises from knowledge that the service exists and will continue to exist independently of any actual or prospective use by the individual.

[28] Option value relates to willingness to pay to guarantee the availability of the service for future use by the individual.

[29]Quasi-option value relates to willingness to pay to avoid irreversible commitment to development now given the expectation of future growth in knowledge relevant to the implications of development.

[30] Existence value is the value a consumer attaches to knowing something exists.

[31] According to Kolstad (2006) altruistic value derives not from personal consumption but from the fact that an individual derives benefits when someone else gains utility. For example, if my neighbor derives benefit from my cleaning my front yard, I obtain utility from the fact that my neighbor is better off.

[32] Bequest value is associated with the well-being of descendants. If an individual values passing a wilderness area on to his/her descendants, it has bequest value to the person, even if s/he never uses it or intends to use it.

[33] In modern societies, politicians and those who vote for them will only give proper attention to environmental considerations if they are stated in monetary terms.

[34] 'Value of ecosystem' that exists prior to the occurrence of primary value that human house derived as an ecosystem service.

[35] The natural environment is essentially inert and passive. Because humans are rational sentient, independent beings, objective scientific knowledge can be utilized to dominate and bend nature to the fulfillment of people's subjective priorities. Individuals, because they are independent beings, their nature being biologically, genetically, inherited, should only be concerned about their own, unique, individual, needs. People are concerned about maximizing personal utility according to their subjective preferences.

[36] A cost or benefit arises from any activity, which does not accrue to the person or organization carrying on the activity. External costs or diseconomies are damage

to other people or the environment, for e.g. by radiation, river or air pollution, or noise, which does not have to be paid for by those carrying on the activity.

[37] Relative prices of goods, services and resources which are proportional to their true opportunity cost for the economy, taking account of any external economies and diseconomies.

[38] Taxes designed to reduce damage to the environment by cutting emissions of products such as CO2 or NO3. Emission taxes can be used as an alternative to, or a supplement for, quantitative controls on emissions.

[39] A measure of the total welfare of the members of a society could be constructed. This would be a function of the welfare of individuals, and the relation among them. Construction of such a function runs into extreme difficulties. A follower of Pareto or a utilitarian would argue that any change which made one individual better off and nobody worse off must be beneficial.

[40] Ethics comes from the Greek word *ethos*, meaning custom, but in its proper philosophical usage it now refers not to how people actually do behave in their dealings with each other, but to how they ought to behave.

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