ENVIRONMENTAL ECONOMICS

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UNIT-1

Environmental Economics-Definition, Nature and Scope- Ecology-Ecological Imbalances-Sustainable Development-Entropy-win-win Trade off-Material Balance-Relationship between Environment and Economics.

ENVIRONMENTAL ECONOMICS – An Introduction

Introduction & Definition

Environmental Economics can be defined as, "That part of Economics which deals with the inter-relationship between environment and economic development and studies the ways and means by neither is the former is impaired, nor is the latter impeded".

An Environmentalist is, "A person who centers his or her political philosophy on the need to preserve the natural environment and to halt or reverse the damage created by industrial development and pollution". Analogous with the term Green, Environmentalist is fewer Environmentalists may come from different political traditions ranging from the radical libertarian to the reformist. The term is also used in philosophy and sociology to indicate a belief that the environment, rather than heredity, has the primary influence on human development.

SCOPE OF ENVIRONMENTAL ECONOMICS

The environment has got a very close relationship with economics. This relation deals with the welfare of the society and the growth theories of economics. This field has become very important in today's context and deals with a very large area.

1. Economics Growth and Environmental Balance: Economics growth and environmental balance do not go together. They both oppose each other. To achieve a higher economic growth, recourses have to be exploited and environment has to be harmed. Environment balance can only be obtained, if resources are not exploited and pollution is not formed. This leads to slow economic growth. It can be seen that both of them are needed for the economy and they oppose each other. The only solution is controlling the scale of pollution and optimal use of the resources. Now nations are concerned about sustainable development, i.e., the frugal use of the resources without endangering the future generations. All economic projects have a cost – benefit analysis must be undertaken to watch the positive and negative points of any point. It is only when the benefit for today is better than the future.

2. Pollution Control and Environment: Economic activities give rise to pollution. This pollution has a serious impact on the environment and the society. It is this society that fees the harmful effects of the pollution.Pollution today have a very high clean up and control cost which ultimately has to be borne by the consumer. The consumer also gets poor living conditions and environmental quality. The question often arises-who should bear this cost / the producers, who are the polluters, will just shift the cost to the consumer. The consumer on the other hand will perhaps sacrifice environmental standards and pollution control so that he is not to pay for the cost of achieving this good environmental quality.

3. Conservation of resources: The environmental is the provider for all the materials needed by the man i.e., air, water, minerals, timber, shelters, food, etc. These resources can be classified as renewable (forest, crops, etc.) and non-renewable (coal, oil, iron, etc.). Each of these resources sometimes has taken centuries to form under conditions that cannot be duplicated. Today these resources are being depleted in a very rapid way and can be exhausted very soon. These resources are scarce and therefore these must be conserved. Optimal use of these resources is a must and wastage must be totally avoided because without these resources, man cannot carry on any economic activity.

ECOLOGY

The word ecology is derived from the Greeks words ‘Oikos’ meaning habitation and ‘logos’ meanings study. Ecology was first described as a separate field of knowledge in 1886 by the German zoologist Ernst Haeckel. In simple words, ecology can be defined as “The study of relation of organism or groups of organisms to their environment”.

The essence of this science is a comprehensive understanding of the importance of these phenomen on.

1. The local and geographic distribution and abundance of organisms.

2. Temporal changes and activities of organisms.

3. The interrelations between organisms in populations and communities (population ecology.

4. The structural adaptations and functional adjustments of organisms to their physical environment (physiological ecology).

5. The behavior of organisms under natural conditions (ethology).

6. The evolutionary development of all these interrelations (evolutionary ecology).

7. The biological productivity of nature and how this may best serve mankind (ecosystem ecology).

8. The development of mathematical models to relate interaction of parameters and predict effects (system analysis).

Ecology tells us about the harmony between the abotic and biotic segment of the community.

ECOSYSTEM

An ecosystem is any spatial or organizational unit which includes living organisms and nonliving substance interacting to produce and exchange of materials between the living and nonliving parts. The term ecosystem is more inclusive then the term of population and community, and habitat. The ecosystem refers to the Dynamics interaction of all the parts of the environment.

The concept of ecosystem provides the central theoretical framework for ecology. Newer studies are quantifying different components of the ecosystem structure and function, so that independent relationships are more preciously understood. It is increasingly important for us to comprehend the dynamics of ecosystems, and their patterns of development, diversity, and stability. We must also understand the impact of human activities on ecosystem structure and function.

ECOLOGICAL IMBALANCES

Industrial development has caused the release of harmful substances into the air, which can cause numerous problems for all living organisms. Excessive air pollution has led to several new problems. These include smog, acid rain, the greenhouse effect and the creation of “holes” in the ozone layer. Each of these problems has serious implications for our health and well being as well as for the whole environment.

1. Smog. Smog is a type of large-scale pollution. It is caused by chemical reactions between pollutants derived from different sources, primarily automobile exhaust and industrial emission. Cities are often centers of these types of activities and many suffer from the effects of smog, especially during the warm months of the year.

2. Acid rain. Another type of air pollution is acid rain. When a pollutant, such as sulphuric acid combines with droplets of water in the air, the water can become acidified. The effects of acid rain on the environment can be very serious. It damages plants by destroying their leaves, it poisons the soil and it changes the chemistry of lakes and streams. Damage due to acid rain kills trees and harms animals, fish, and other wildlife.

3. Greenhouse effect. The Greenhouse effect, also referred to as global warming, is generally believed to come from the buildup of carbon dioxide gas in the atmosphere. Carbon dioxide back to oxygen, but the release of carbon dioxide from human activities is higher than the world's plants can process. The situation is made worse since many of the earth's forests are being removed and plant life is being damaged by acid rain. Thus, the amount of carbon dioxide in the air is continuing to increase. This buildup acts like a blanket and traps heat close to the surface of our earth. One of the consequences of polar ice cap melting would be a rise in global sea level, resulting in widespread coastal flooding. Climatic change may lead to heavy rainfall in some areas, and drought in others, melting of glaciers, early arrival of spring and warming of the oceans.

4. Depletion of the Ozone layer. Ozone depletion is another result of pollution. Chemicals released by our activities, affect the stratosphere, one of the atmospheric layers surrounding earth. The ozone layer in the stratosphere protects the earth from harmful ultraviolet radiation from the sun. Release of chlorofluorocarbons (CFC's) from aerosol cans, cooling systems and refrigerator equipment removes some of the ozone, causing "holes"; to open up in this layer and allowing the radiation to reach the earth. Ultraviolet radiation is known to cause skin cancer and damaging effects on plants and wildlife.

SUSTAINABLE DEVELOPMENT

Well-educated, healthy populations are of fundamental importance in raising levels of social-economic development. Numerous studies now document the positives correlations among, for example, women's education, reduced fertility, and improve child health, and also between literacy rates and average per capita incomes.

Good education and health do not follow as an automatic consequence of economics growth but depend on government action, especially policies that target primary-level education and health care. The provision of high-quality basic social

services benefits the poorer members of society, who cannot afford private alternatives, as well as the economy as a whole.

One multicountry study has indicated that a 10-percent increase in my life expectancy raises the national economic growth rate by about 1 percent per year. Other research suggest that increasing the average education of the labor force by 1 year raises the GDP by 9 percent, although this holds true only for the first 3 years of extra education, with diminishing returns thereafter.

POPULATION

Fertility rates: The most rapid fertility declines have so far occurred in countries that have achieved major improvements in child survival rates and educational levels and have implemented family planning programs (for example, Colombia and Kenya). These developments, in turn, are often associated with economic growth and social changes including improved reproductive rights, rural-urban shifts, new family structures, and new employment patterns, especially changes in female labor force participation rates.

Demographic transition: Demographic experts believe that the shift from high to low birth rates, and from low to high life expectancy, is brought about by "social modernization". This complex of changes involves improved health care and access to family planning; higher educational attainment, especially among women; economic growth and rising per capita income levels; and urbanization and growing employment opportunities. Stabilization of the world's developing countries.

Production

Intensification of production, obtaining more output from a given area of agricultural land, has thus become a growing necessity. In some regions, particularly in Asia, this has been achieved primarily through producing multiple crops each year in irrigated agro ecosystems using new, short-duration crop varieties.

There has also been notable intensification of agricultural land use around major cities (and to an unexpected extent, within cities), particularly for high-value perishables such has dairy and vegetables, but also to meet subsistence needs.

Over the past three decades, the per capita increase in production of the world's three major cereal crops has been positive (up by 37% for maize, 20% for rice, and 15% for wheat) and prices in real terms for these crops have dropped (down by 45% for maize, 33% for rice, and 38% for wheat). Lowering the prices of major staples directly benefits the poor who spend a large part of their income on purchasing food. The main reason for these successes includes:

1. a continuous flow of new production technologies such as improved seeds, better management practices, and improved pest and disease control, all areas in which the CGIAR has heavily involved;

2. the commercialization of farming that has increased the availability and quality of production inputs and created more efficient means of marketing outputs, a direct result of good public policies; and

3. The expansion of international trade that has minimized price differences between locations and seasons, and fostered production patterns based on comparative advantage.

World food production has tripled since 1950, the price of food has dropped by nearly 50 percent and the land used in agriculture has increased by nine percent.

ENTROPY

In early days, man had to depend on only muscle power; in due course, he domesticated many animals and used these beasts of burden and thus augmented muscle power with animal power. With the invention of machines and other mechanical devices, we were able to accomplish great quantum of work with little energy. The combination of muscle power, animal power and mechanical power helped man to build many wonders like pyramids, temples with massive structures,

forts, Palaces and irrigation projects etc., besides the wonderful transport system of modern days.

Thermodynamics is an applied science, that studies and interprets the relationship among energy, heat and work. It helps understanding the technological foundation that helps society to progress with machines. James P. Joule, a British scientist established a principle called "First Law of Thermodynamics". The second law of Thermodyamics was formulated by Sadi carnot, a French Physicist.

A German Physicist called Rudolf Clausin in 1850 found out a corollary of the Second Law of Thermodynamics. This is called the **Law of Entropy.**

Entropy means transformation. Entropy law is used not only to describe the process of energy conversion in engines but also the circumstances of many other systems, including those of Physics, Economics, Biology, Urban Development etc.

WIN-WIN TRADE OFF

Economics is a science which tells about utilization of resources given by Nature for the development of humanity. Ecology tells about harmony between nature and man. Economics upsets the harmony between Nature and man by utilsing the resources extensively. Besides utilizing the resources for the production of material comforts and goods, the production process pollutes nature by emissions and wastes.

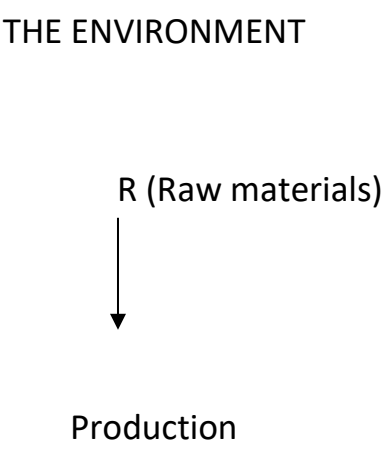
Exploitation of nature has gone to the extent of bleeding nature. The incompatibility of ecological principle ad non-sustainability of ecosystem in the process of Economic growth and business profitability have become the major part of study of economics of Environment. There must be proper trade-off between economic development and exploitation of resources without impairing the ecological balance. The reconciliation of interest between economic development and ecological balance has become imperative. For this there should be

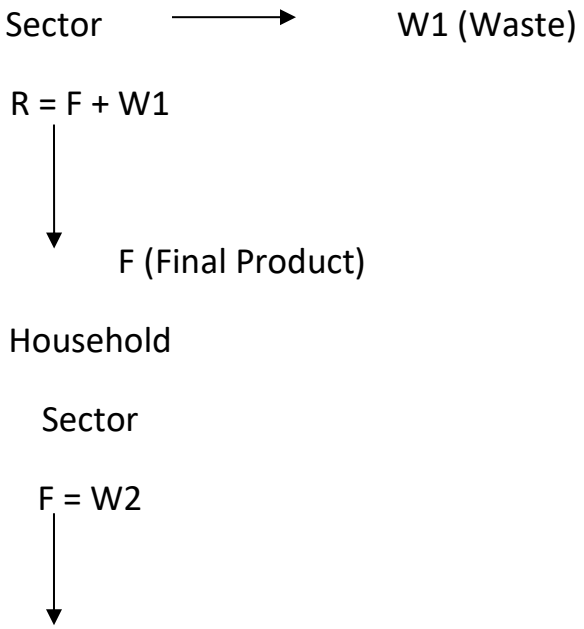
reorientation of economic policies and principles in the context of ecological principles and development.

MATERIAL BALANCE MODEL

The environment has got a fixed amount of mass which takes the form of soil, plants minerals, etc. This mass changes from one form to another due to environmental or man-made influence. For example, water takes the form of ice, snow, vapor, etc. No matter what be the shapes, the entire mass of water in the environment does not change. Even if the water is split into oxygen and hydrogen, the total quantum of the elements is the same as that of the original water. The "Material Balance Model" studies the relationship between the environment and the economy. In the production sector and household(consumption) sector.

It is an the production sector where all the economic activities of production come together with the factors of production being used to produce a finite quantum of goods. The household sector on the other hand consumes the goods produced in the production sector. This sector is made up of the consumers in the economy.





MATERIAL BALANCE MODEL

Assuming the economy to be this simple, two sector model existing in the environment, the material balance model can be explained. This model follows the “Law of conservation of matter” producing a commodity must be equal to the mass of all the inputs. This theory also assumes that there are no exports and that there is no stock accumulation or hoarding.

The production sector uses R units of raw material from the environment to produce F units of the final product. While doing so, it also W1 amount of waste.

In the production sector, R = F + W1

The household sector consumes all the F units which are produced in the production sector. While doing so, there is a lot of waste produced. This waste can be packaging, by-products, etc. This entire amount is returned to the atmosphere producing W2 units of waste.

In the household sector, F = W2

Hence in the economy, R = W1 + W2

The entire mass of inputs (raw materials) equals the entire mass of output (waste). This is the “Material Balance Model”.

RELATION BETWEEN ENVIRONMENT AND THE ECONOMY

The environment and the economy are very closely related. The environment provided the resources for production and consumption context, all economics systems are concerned with the four central goals: efficiency, equity (both microeconomic variables), stability and growth (Macroeconomic variables).

1. Efficiency. Perfect efficiency in the utilization of resources exists if all goods are being produced at the lowest possible cost and if the composition of total output is such that consumer welfare cannot be improved by any change in the output mix. It is only with the optimal use of the resources costs can be lowered. Then again, there can exist environmental damage as a result of keeping costs down, for example, inadequate treatment of effluents. High competition and monopolistic tendencies have also been known to damage the environment.

2. Equality. Equity considerations, particularly income distributions, are not built into the economic system and the government must take into account while making various decisions regarding existing environmental problems. The values of human and physical resources are affected by changes I environmental regulations. For example, If a leather tannery unit is forced to shut down, the employees and the employers lose a lot. Workers lose their jobs and their sources of income and the owners find their investment has lost a lot of value and is giving no return. Hence equality also plays a role in the environmental decisions.

3. Stability. Economics are very volatile and new environmental measures and controls can have drastic consequence on the performance of the industry. For example, If new pollution control measure are introduced in an already existing industry, there are greater capital and operating cost on the firm. This is a

threat to macroeconomic stability. A sudden increase in investment could be inflationary.

4. Growth. All economic systems aim for achieving high growth rates. The production of capital goods results in higher future production of consumer goods. As long as the rate of growth in real output exceeds the rate of the population growth, standard of living improves. Environmentalists often attack the growth goal, which they say, causes more pollution, a faster depletion of natural resources, less open space and a general decline in the quality of life. Society often faces the dilemma of choosing with a clean, safe environment and economic growth.