AN INTRODUCTION TO ENVIRONMENTAL ECONOMICS

Introduction:

Dear friends. In this session I intend to explain the fast growing and evolving aspects of environmental problems and issues, that is 'an introduction to environmental economics'.

The environmental economics is four and half decades old, it has entered in the mainstream of economics and ascending since last two decades. It has become a major player in environmental policy and has drawn serious attention of interegrutia, academia and world politicians. It has gained economic content with newly emerged economic topics such as economics of natural resources, natural resource conservation strategies, environmental and development economics, sustainability and biodiversity. Enormous research has been done, new generals on the subject are now published, many books have written and more projects and literature on the subject are in pipe line. It has become comprehensive in the sense that it covers economy, ecology sciences and society. Its approach is holistic for its covering the varieties of subjects and concern for eco social and cultural problems.

The basic principles of economics and its hard core, micro-macroeconomics such as trade-offs, incentives, rationality, externalities, public goods, market, governmental institutions, population growth, food security, urbanization, health, education, poverty, resilient cities, have been embodied rigorously in the analysis of environmental problem and policies, from sub subject of economics it has become a subject and looked at from different dimensions and analyzed from different perspectives-becoming interdisciplinary in nature. Moreover, the local global linkages are visible in environmental issues. Bidirectional transmission is seen from local to global and global to local. There has been a dedicated effort to bringing economist and ecologists closer together in a common search for appropriate solution for environmental challenges.

Economics and Environment

The beauty of economic theory is its utility of explaining relationship between different economic variables by logical reasoning. Methodologically the deductive reasoning of its approach enables us to see that in reality. In an economic system three major agents, consumer, producer and government act, react and interact. They take decisions of market signals as to what to consume, produce and distribute. The households and firms, consumption and production are drawn from natural resources of each. Their activities generate by products that distort and damage the environment. Thus economic activities are connected with environment with environmental problems. In order to examine these connections we can follow two standard models, namely; (A) Circular flow model and material balance model.

(A) Circular flow Model

This model explains how the economy as a whole is functioning. It explains the connections between household and product market and firms and factor market. The flows of goods and services and income and expenditure are explained by circular flow diagram.



This circular diagram is schematic representation of the organization of economy. Decisions are made by households and firms. Households and firms interact in the markets for goods and services where households are buyers and firms are sellers and in the markets for the factors of productions where firms are buyers and households are sellers. The outer set of arrows shows the flow of income and the inner set of arrows shows the corresponding flow of inputs and outputs. Its simplicity is important for it is useful for understanding that how the pieces of the economy fit together. However, simple model does not explicitly explain the linkages between economic activity and the environment. In order to demonstrate these linkages, the circular flow model must be expanded to show market activity as a part of a broader model which is reckoned as the material balance model.

(B) Material Balance Model

This model depicts the explicit relationship between economic activity and the natural environment. It is an extended version of circular flow model which incorporates the exploitation of natural resources by households and firms for consumption and production and the residuals are released from consumption and production which concern with environmental problems. More precisely it shows the larger picture of the connections between economic decision making and the natural environment.



The figure represented here shows that how circular flow diagram is connected with nature. The firms and households produce and consume by making use of natural resources and release residuals (the waste and the byproduct) which affect the environment. It also shows that how recovery, recycle and reuse are taking place that connects factor market. From this figure we can distinguish between Natural resource economics and the Environmental economics. The former indicates the flow resources and the later indicates the flow of residuals. The natural resource economics deals with the flow of natural resources from nature to economy. The environmental economics deals with the flow of residuals from economic activity back to nature.

What are these residuals that explain the environmental economics? They are the gases released into the atmosphere, though most of them may not be harmful because of the assimilative capacity of the environment i.e. gases released by the use of oil, coal and natural gas (carbon dioxide), though in the long run when the layer of carbon dioxide get thicker on planet than it harms the environment. There are also liquid residues, such as industrial waste waters, and other hazards of wastes and garbage which are potential threats to health and the ecology. we can notice in the figure that there are two residual outflows, one leading from each of the two market sectors, meaning that residuals arise from both consumption and production activity which are chief concern of environmental economics. Thus environmental economics can be reckoned as a field of study deals with the flow of residuals from economic activity back to nature. The residuals flow back to nature by recovery, recycling and reuse. The figure represented shows that there are inner flows running from the two residual affairs back to the factor market. In fact, what the materials balance model shows is that all resources drawn from the environment ultimately return back to nature in the form of residuals. The two flows are balanced. This is a profound fact supported by science.

Though natural resource economics and environmental economics both have concern with the natural world, but not free from differences. The natural resource economics is concerned with the appropriate inter-temporal use of natural resources-both renewable and non-renewable. Environmental economics, on the other hand, generally involves questions of excessive production of pollution by the market or inadequate protection of the natural world, due to market failure. It concerns with static questions of resource allocation. Resource economics on the other hand deals with dynamics that is, with the changes of course of nature. World over, environmental problems are general and they are seen in both, developed and developing countries though they may be different in this intensity, degree and volume.

Understanding Material Balance by means of Science

The environmental problems and issues are composite in nature. Natural sciences can accurately and clearly explain the damaging effects on environmental caused by economic activity and can also explain the thread it gives to human and non human lives. The law of physics namely; the law of thermodynamics can help us in this regard. According to first law of thermodynamics, matter and energy can neither be created nor destroyed. Applying this fundamental law to the material balance model in the long run, the flow of materials and energy drawn from nature into consumption and production must equal the flow of residuals that run from these activities back into the environment. What it tells us is that in the process of transforming raw materials in the commodity nothing is lost. Over a time materials become residuals and return to nature. These residuals are gases or disposals. The recovery, recycling and reuse of goods are temporary. In the end we have wastes.

Since, as per the first law of thermodynamics the matter and energy cannot be destroyed, implies that materials flow can go on forever. However the second law of thermodynamics states that nature's capacity to convert matter and energy is not infinite. During energy conversion, some of the energy becomes unusable. It still exists, but it is no longer available to use in another process. Hence the fundamental process on which economic activity depends is finite.

From the natural science point of view the material balance model enable us to infer two important points; (1) We must recognize that every resource drawn into economic activity ends up as residuals, which has potential to damage the environment, and (2) Nature's ability to convert resources to other forms of matter and energy is limited.

Material Balance Model's roots in science and its explanation of connections between economic activity and nature motivate us to study the discipline of environmental economics.

Environmental Damage

The prime and foremost damage of environment is pollution. The air, water and noise pollutions are standard forms. Depuration of natural resources, deforestation and massive distortions in natural set up of planet, negative externalities of rapid urbanization and exponential growth of population. They multiply economic, social and political problems. Pollution is associated with the flow of residuals and is defined as the presence of matter or energy whose nature, location or quantity has undesired effects on environment.

Causes of Environmental Damage

There are mainly two causes of environmental damage namely; (1) natural pollutants and (2) anthropogenic pollutants

- Natural Pollutants arise from non-artificial processes in nature, such as particles from volcanic eruptions, salt spray from oceans and pollen.
- Anthropogenic pollutants are human induced and include all residuals associated with consumption and production e.g. gases from combustion and chemical waste from certain manufacturing processes.

Sources of Environmental Damage

There are many sources of environmental damage. e.g. automobile, waste disposal sites, excess rail fall when it transports chemical pesticides and fertilizers from farm land to nearby lakes and streams. They appear on air, water and land. They are usually classified as; (1) Stationary Source: A fixed-site producer pollution (2) Mobile source: Any non stationary polluting source (3) Point Source: Any single identifiable source from which pollutants are realized, (4) nonprofit source: A source that cannot be identified accurately and degrades the environment in a diffuse, indirect way over a broad area.

Local Pollution:

It is confined to a single community and its negative effects are limited in scope. Generally they pose risk to the society and difficult to control, e.g. urban smog which is seen in big, highly urbanized and densely populated cities. Another example is solid waste pollution caused by poor management practices of local political body that allow diseases to spread with contaminated water supply.

Regional Pollution

It refers to degradation that extends well beyond the polluting source. It poses a risk beyond the polluting source. An important example is acidic deposition which is commonly known as acid rain. Acid rain is characterized as regional pollution because the harmful emissions can travel hundreds of miles from thin source. Another example of regional pollution is the Gulf Oil Spill that occurred in 2010.

Global Pollution

This pollution covers the entire globe. Its effects are wide spread with global implications. Global pollution is difficult to control for the risk associated with it are widespread and lack of international cooperation. Global warming is another example of this type of pollution, which results into abnormal changes in the temperature on earth. It is also known as green house effect for more than normal carbon dioxide is absorbed in the air. It adversely affects the agriculture productivity, weather condition and oceans on the earth. Global warming also refers as climate change-that results into major alteration in any climate measure, including temperature and wind. This type of pollution alters the oceanic circulation or variance in Sun's intensity. It has also to do with deforestation.

Ozone depletion, a thinning of earth's ozone layer is also a type of global pollution. The ozone layer protects the earth from harmful ultraviolet radiation, which can weaken human immune systems, increase the risk of skin cancer, and harm ecosystem.

Identifying Environmental Objectives

It is true that fundamental environmental problems are universal and hence they have drawn serious attention of world think tanks. Inter-actual debates were hold world over.

The national leaders, industry officials, academia, intelligentsia and specialized environmentalist come close to each other by negotiations to gain cooperation for ascertaining the environmental objectives for designing appropriate policy to combat environmental degradation. In 1992, the United Nations Conference on Environment and Development (UNCED) held in Rio de Janerio known as Earth summit which followed by Stockholm conference to think seriously to arrest increasing environmental degradation, was attended by 6000 delegates from more than 170 countries. In 2011 the United Nations Climate Conference was held in South Africa to continue negotiation on the line of Kyoto Protocol. As a result of this now world over three objectives are fixed, namely; (1) Environmental Quality, (2) Sustainable Development and (3) Biodiversity

(1) Environmental Quality

Though it is difficult to define this concept but generally it is agreed that it is with regard to cleanliness, it means clean air, water and land. The rational perception of environmental quality is that it represents a reduction in anthropogenic contamination to a level that is "acceptable to society. It aims at imparting gains to human health and ecosystems, expenditures needed to achieve the reduction, availability of technology, and the relative risk of given environmental hazard.

(2) Sustainable Development

Achieving sustainable development is a very vital objective. The concept proclaims that in pursuing economic development in present we ought to bear in mind the welfare of future generation. It gives caution that efforts for development should not result in to ecological imbalance and any kind of threats and insecurities to future generation. The concept of sustainable development has become a major sub-field of environmental economics; the concept of sustainable development has become 'holistic' in nature much discussed, controversial, and in a state of enduring discussion.

(3) Biodiversity

Maintaining and preserving biodiversity is one of the most significant and prime objectives of environmental policies. It refers to the variety of distinct species, their genetic variability, and the variety of ecosystems they inhabit. Humanity is putting so much pressure on the Earth that it is causing a dramatic increase in the rate of species extinction, estimated to be more than a thousand times faster than before the Industrial Revolution. There are many other phenomena associated with this loss of species, such as decline of genetic diversity within species and the abundance of particular species. The combined effect is so large that it is causing what could be the sixth great extinction on the planet.

The major threat to biodiversity, however, is natural habitat destruction linked to change in land wise, which affects entire ecosystems. Population growth and economic development are primarily responsible for this destruction, which includes the harvesting of tropical forests and the engineered conversion of natural landmasses to alternative uses.

Environment Policy Planning

As we have seen that environmental quality, sustainable development and biodiversity are the prime goals, then in order to achieve them we should design appropriate policy and effective planning. We should incorporate different governmental and non-governmental institutions. For this we must also invite public participation at different levels of policy initiatives and planning. Public sector, private sector, unions, citizens, environmentalist and industry all should be involved in environmental policy planning. The map should be drawn to show that different parties involve in Environmental planning.



State and Local Government

National Environmental Policy Act (NEPA)

In order to detect and control the contamination of food and the use of food additives such Act is necessary. Such act can guide us in formation of environmental policy which can bring impact on environmental degration. The underlying tool that guides this policy planning process is risk analysis, which comprises two decision making procedures: risk assessment and risk management.

Risk Assessment

The environmental objectives must be met with limited amount of economic resources. It means that as problems are identified, they have to prioritize. This is done through scientific assessment of the relative risk to human health and the ecology of the given environmental hazard-This is known as risk assessment. To put it differently, it is quantitative and qualitative evolution of the risk posed to health or by an environmental hazard.

Risk Management

Risk management refers to the decision making process of evaluating and choosing from alternative responses to environmental risk. In public policy context risk responses refer to various types of control instruments, such as a legal limit on pollution releases or a tax on pollution generating products. It's objective is to choose a policy instrument that reduces the risk of harm to society.

Policy Evaluation Criteria

There are three policy evaluation criteria namely; (1) Allocative efficiency (2) Cost effectiveness and (3) Environmental Justice

This allocative efficiency criterion requires that resources be appropriated such that the marginal benefits to the society are equal to the marginal cost.

The cost effectiveness criterion requires that the least amount of resources be used to achieve an objective.

The environmental justice criterion emphasizes on fairness of the environmental risk burden across segment of society or geographical region.

Governmental policy Approach

Government's intervention is necessary to improve the damaged condition of environment. It has two approaches, namely, Command and control approach and market approach.

The command and control policy is one that directly regulates polluters through the rules and standards fixed by the government a polluter who violets these rules and standards is subject to fine or closure of the unit.

The market approach is an incentive based policy that encourages conservation practices or pollution reduction strategies.

There is one more approach that government follows, i.e, "Polluter-pays principle". According to this principle the polluter has to pay to the government the extent to which he pollutes the environment.

Summary

Environment problems and issues are serious and pressing. The generate insecurity and are threat to humanity, nonhuman being and varied species of nature's creation. Natural resources are depleted and destroyed and this is a grave concern to present and future both and a serious peril to human and non human existence.

The material balance model is an integrated model of ecosystem and nature. It shows the strength of relationship between nature and ecosystem and ecology and shows that how wrong policy decisions and perceived conception of economic development results in to drastic environmental consequences. There has come now awareness and realization world over that how serious environmental problems are and how to resolve them. Agendas are set, commissions and committees are formed. Conferences and summits are arranged as to find out the way to solve environmental problems. In this regards Laws, rules, regulations and different institutional structured are raised.

Economics as a social science, abundant with scientific space that has given place to this subject and made it rigorous and scientific. However there are more opportunities and challenges that economics is capable to face it and resolve as well. The Rio summit has rightly pointed that.

"The earth summit is not an end in itself, but a new beginning. The road beyond Rio will be a long and difficult one; but it will also be a journey of renewed hope, of excitement, challenge and opportunity, leading as we move into the 21st century to the dawning of the new world in which the hopes and aspirations of all the world's children for a more secure and hospitable future can be fulfilled."