ECS2606 NOV'18

1. Explain the difference between neoclassical environmental economics, resource economics and ecological economics. [10]

Resource economics: Sees nature as a provider of energy and materials. Is an anthropocentric view. Interdisciplinary. Looks at sustainability and the interdependence of economic and ecological systems. For this type of economics, natural sciences are needed to gain an understanding of economic/environmental problems.
Primary problem: limited stocks and the cake-eating problem.
Resources in conventional economics are thought to be Labour, Capital Land and energy. They can be subdivided in the following categories:
In a simple model, the relationship between nature and the economy can be described as nature:
1. Being a source of inputs for economic activity
2. Nature as a sink for wastes from economic activities.

Firms and households substract resources, and put wastes in the waste sink function. Among each other they trade labour and commodities and money.
It can be further extended by assigning 4 basic functions to the environment:
1. Resource and energy base
2. Amenity services
3. Waste sink
4. Life support functions for humans

Ecological economics
-Thermodynamics –laws of physics about matter and energy
-Matter evolves –through adaptation and learning, evolution, or positive feedback loops, occur
-Steady state – resources for production and pollutants are kept steady
-Distribution of rights is important for sustainability as whoever owns the right controls how that good is used, the type of products produces, and who consumes the goods
-Ecology defined as the "study of the economy of nature" and economics as the "ecology of humans" – at its core, ecology is the "relationship of organisms to their environment"
-ecology and economics exhibits nonlinear dynamics and is constrained and structured by flows of energy
-Externalities needs to be incorporated into the market through more extensive valuation techniques
-Uses a transdisciplinary approach – necessary for construction and analysis of wicked problems

Neoclassical Economics
-Markets guide humans –

-Resources are scarce –
-Diminishing marginal returns on the basis that local systems have negative feedback loops
-Markets have externalities that do not affect operation of market
-There is an efficient use of a resource over time that is determined by the interest rate and price

-Approach is often linear (restricted to such by mathematics) and developed in isolation from other areas of study
-Natural capital can be replaced with built or human capital

For ecological economics there are two kinds of capital: Natural and manmade. Consequently, there are two sources for our welfare: Services of natural capital (ecological services) and manmade capital. **And that's the main biggest difference between the conventional (neoclassical) and ecological economics.** Conventional economists have a narrow minded focus on manmade capital and services. They usually ignore that an intact ecology provides us with the most essential products and services like clean air and water, mild climate, food, medical plants, erosion prevention, recreation, meaning and enjoyment in life.

2. Differentiate between environmental, economic and regulatory impact analysis. [10]

Environmental Impact Analysis

An environmental impact analysis (EIA) is essentially an identification and study of all significant environmental repercussions stemming from a course of action. For the most part, these focus on impacts that are expected to flow from a proposed decision, although retrospective EIAs are of great value also, especially when they are done to see if earlier predictions were accurate. EIAs can be carried out for any social action, public or private, industrial or domestic, local or national. They are largely the work of natural scientists, who focus on tracing out and describing the physical impacts of projects or programs, following through the complex linkages that spread these impacts through the ecosystem. They do not directly address the issue of placing social values on these impacts.

Many countries have laws requiring environmental impact studies when substantial public programs and projects are under consideration, as well as private projects in some cases. In the United States, environmental impact analyses are mandated by the **National Environmental Policy Act of 1970** (NEPA). The resulting environmental impact statements (EIS's) are primarily the work of natural scientists, yet economists have a distinct role to play.

It is not only ecological linkages through which environmental impacts spread; they also spread through economic linkages. Suppose, for example, it is proposed to build a dam that will flood a certain river valley while providing new flat-water recreation possibilities. A substantial part of the environmental impact will stem from the inundation itself and the resulting losses in animals and plants, wild-river recreation, farmland, and so on. But much also could come from changes in patterns of behavior among people affected by the project. Recreators traveling into and out of the region could affect air pollution and traffic congestion. New housing or commercial development spurred by the recreation opportunities could have negative environmental effects. Thus, to study the full range of environmental impacts from the dam, it is necessary to include not just the physical effects of the dam and its water impoundment, but also the ways in which people will react and adapt to this new facility.

Economic Impact Analysis

When interest centers on how some action—a new law, a new technological breakthrough, a new source of imports, and so forth—will affect an economic system, in whole or in terms of its various parts, we can speak of **economic impact analysis**. In most countries, especially developing ones, there is usually wide interest in the impact of environmental regulations on economic growth rates. Sometimes the focus will be on tracing out the ramifications of a public

program for certain economic variables that are considered particularly important. One might be especially interested, for example, in the impact of an environmental regulation on employment, the impact of import restrictions on the rate of technological change in an industry, the effects of an environmental law on the growth of the pollution-control industry, the response of the food industry to new packaging regulations, and so on.

Economic impact analyses can be focused at any level. Local environmental groups might be interested in the impact of a wetlands law on the rate of population growth and tax base in their community. Regional groups might be interested in the impacts of a national regulation on their particular economic circumstances. At the global level, an important question is how efforts to control carbon dioxide (CO_2) emissions might impact the relative growth rates of rich and poor countries. Whatever the level, economic impact analysis requires a basic understanding of how economies function and how their various parts fit together.

Regulatory Impact Analysis

Regulatory agencies and others are concerned with the array of possible impacts that might result from any actual or proposed regulation. What has developed over time, therefore, is the concept of **regulatory impact analysis** (RIA), which is supposed to systematically and comprehensively identify and estimate the impacts flowing from regulations. Many countries have requirements for doing these types of studies, and they differ somewhat in terms of what kinds impacts they focus on and some of the procedures for carrying them out.[1] In the United States, RIAs essentially involve full **benefit–cost analyses** of regulatory options. We will discuss benefit–cost analysis later in this chapter.

3. Make use of examples to explain the difference between opportunity cost and external cost. [10]

Opportunity cost is the value of something when a particular course of action is chosen. Simply put, the opportunity cost is what you must forgo in order to get something. The benefit or value that was given up can refer to decisions in your personal life, in a company, in the economy, in the environment, or on a governmental level.

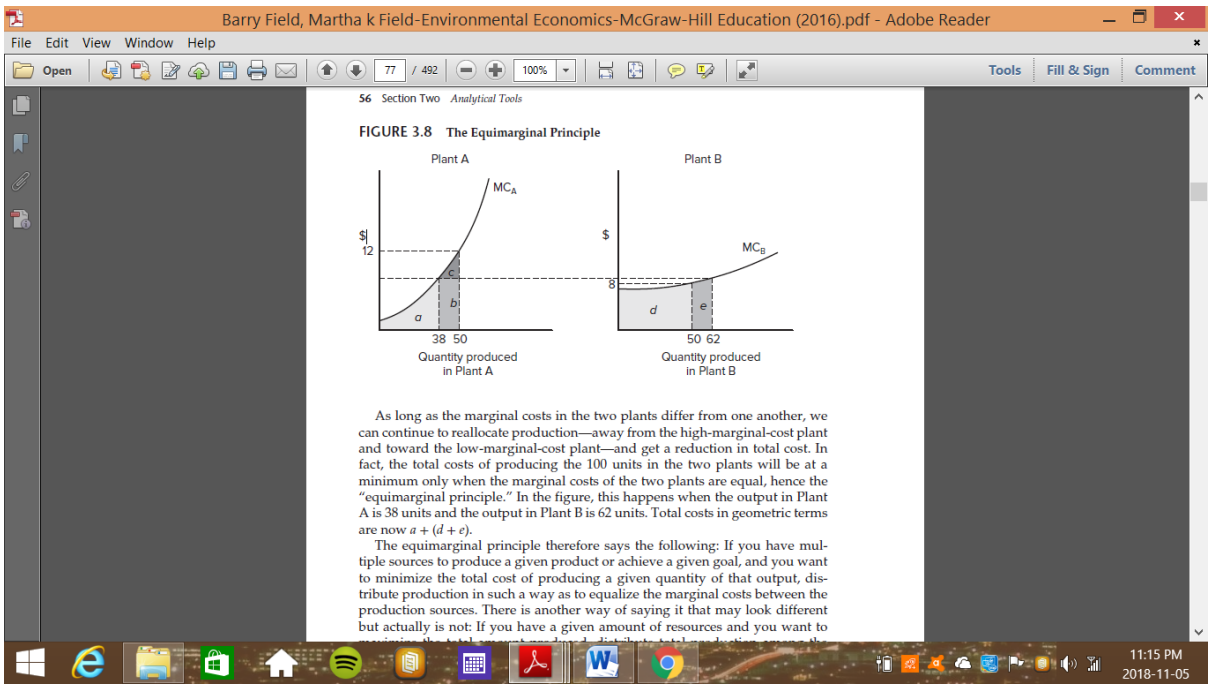
Examples of Opportunity Cost

- Someone gives up going to see a movie to study for a test in order to get a good grade. The opportunity cost is the cost of the movie and the enjoyment of seeing it.
- At the ice cream parlor, you have to choose between rocky road and strawberry. When you choose rocky road, the opportunity cost is the enjoyment of the strawberry.
- A player attends baseball training to be a better player instead of taking a vacation. The opportunity cost was the vacation.
- Jill decides to take the bus to work instead of driving. It takes her 60 minutes to get there on the bus and driving would have been 40, so her opportunity cost is 20 minutes.
- This semester you can only have one elective and you want both basket-weaving and choir. You choose basket weaving and the opportunity cost is the enjoyment and value you would have received from choir.
- The opportunity cost of taking a vacation instead of spending the money on a new car is not getting a new car.
- When the government spends $15 billion on interest for the national debt, the opportunity cost is the programs the money might have been spent on, like education or healthcare.
- If you decide not to go to work, the opportunity cost is the lost wages.
- For a farmer choosing to plant corn, the opportunity cost would be any other crop he may have planted, like wheat or sorghum.

External costs are costs that are not included in what the business bases its price on. These include:

- the cost of disposing of the product at the end of its useful life
- the environmental degradation caused by the emissions, pollutants and wastes from production
- the cost of health problems caused by harmful materials and ingredients
- social costs associated with increasing unemployment due to increasing automation

8.Use a graph to explain how the equimarginal principle can be applied to minimise production costs. [10]



The equimarginal principle is explained in Figure 3.8 (Field & Field, 2016:55–56). This principle states that if you have multiple sources to produce a given product, and you want to minimise the total cost of producing a given quantity of that output, you should distribute production in such a way as to equalise the marginal costs between the production sources. Plant A uses old technology, marginal cost curve starts relatively low, but rises steeply as production rises, and Plant B uses newer technology, has a higher marginal cost at low output levels, marginal costs do not rise as steeply as production increases. For these two plant firms to produce the total output of 100 units, for Plant A to produce an output of 50 units has a marginal cost of $12, whereas for Plant B to produce 50 units has a marginal cost of $8. The total cost of the 100 units can be lowered by reallocating production. Reduce production in Plant A by 1 unit and costs will fall by $12. Then increase production in Plant B by 1 unit and costs will rise by $8. Total output is still 100 units, but there has been a cost saving of $12-$8=$4. Therefore, total cost, the sum of the costs in the two plants, has gone down. The total costs of producing the 100 units in the two plants will be at a minimum only when the marginal costs of the two plants are equal, hence the “equimarginal principle”. The equimarginal principle therefore says the following: If you have multiple sources to produce a given product or achieve a given goal, and you want to minimize the total cost of producing a

given quantity of that output, distribute production in such a way as to equalize the marginal costs between the production sources.

9. Make use of your own example to explain the concept of market failure. [10]

Market Failure-This occurs when there is an inefficient allocation of resources in a free market. Market failure can occur due to a variety of reasons, such as monopoly (higher prices and less output), negative externalities (over-consumed) and public goods (usually not provided in a free market).

Types of market failure:

1. Positive externalities – Goods/services which give benefit to a third party, e.g. less congestion from cycling
2. Negative externalities – Goods/services which impose cost on a third party, e.g. cancer from passive smoking
3. Merit goods – People underestimate the benefit of good, e.g. education
4. Demerit goods – People underestimate the costs of good, e.g. smoking
5. Public Goods – Goods which are non-rival and non-excludable – e.g. police, national defence.
6. Monopoly Power – when a firm controls the market and can set higher prices.
7. Inequality – unfair distribution of resources in free market
8. Factor Immobility – E.g. geographical / occupational immobility
9. Agriculture – Agriculture is often subject to market failure – due to volatile prices and externalities.
10. Information failure – where there is a lack of information to make an informed choice.
11. Principal-agent problem – Two agents with different objectives and information asymmetries

Public Goods

Consider a lighthouse. This is a service provided to mariners at sea so that they can locate themselves and avoid running aground at night. But the lighthouse has an interesting technical characteristic: If its services are made available to one mariner at sea, they immediately become available to all others in the vicinity. Once the services are made available to one person, others cannot be excluded from making use of the same services. This is the distinguishing characteristic of a **public good.** It is a good that, if made available to one person, automatically becomes available to others. Another example of a public good is a radio signal. Once a radio station broadcasts a signal, it is available to anybody who has a receiver. Each individual can listen to the broadcast without diminishing its availability to all other people within range of the station. Note carefully that it is not the ownership of the supplying organization that makes a public good public. Lighthouses are usually publicly owned, but radio stations, at least in the United States, are typically privately owned. A public good is distinguished by the technical nature of the good, not by the type of organization making it available. We are interested in public goods because environmental quality is essentially a public good. If the air is cleaned up for one person in an urban area, it is automatically cleaned up for everybody else in that community. The benefits, in other words, accrue to everyone in the community. Private markets are likely to undersupply public goods, relative to efficient levels. To see why, let's look at another very simple example: a small freshwater lake, the shores of which have three occupied homes. The people living in the houses use the lake for recreational purposes, but, unfortunately, the water quality of the lake has been contaminated by an old industrial plant that has since closed. The contaminant is measured in parts per million (ppm). At present the lake contains 5 ppm of this contaminant. It is possible to clean the water by using a fairly expensive treatment process. Each of the surrounding homeowners is willing to pay a certain amount to have the water quality improved. When a public good is involved, each person may have an incentive to **free ride** on the efforts of others. A free rider is a person who pays less for a good than her or his true marginal willingness to pay, that is, a person who underpays relative to the benefits she or he receives. Free riding is a ubiquitous phenomenon in the world of public goods, or in fact for any good for which its consumption produces external benefits. Because of the free-riding impulse, private, profit-motivated firms will have difficulty covering their costs if they go into the business of supplying public goods.

Because of these reduced revenues, private firms will normally *undersupply* goods and services of this type. Environmental quality improvements are essentially public goods. Because we cannot rely on the market system to provide efficient quantities of goods of this type, we must fall back on some type of nonmarket institution involving collective action of one type or another. In the lake example, the homeowners may be able to act together **privately,** perhaps through a homeowners' association, to secure contributions for cleaning up the lake. Of course, the free-rider problem will still exist even for the homeowners' association, but if there are not too many of them, personal acquaintance and the operation of moral pressure may be strong enough to overcome the problem. When there are many more people involved (thousands, or perhaps millions, as there are in many large urban areas), the free-rider problem can be addressed effectively only with more direct governmental action. This opens up the huge topic of **public policy** for environmental quality, a topic we will spend much more time discussing throughout the rest of the book.

OR

You can use The Brenton Blue Butterfly story

13. Discuss in detail the different approaches to sustainable development. [25]

The main issues in sustainable development are as follows:

(a) Sustainable development is about biophysical limits.
(b) It goes further than the neoclassical concept of the efficient allocation of scarce
resources.
(c) It requires a careful scrutiny of our technological choices and our social and value
systems.
(d) It deals with decision-making under extremely uncertain circumstances.

It is important to differentiate between the different forms of sustainable development.

Weak sustainability. This is nearly the same as the neoclassical approach, as this approach assumes that natural and human capital are substitutes for each other. The sustainability rule developed by Hartwick (Tietenberg 2003:97) therefore states that, "the focus of concern is on the prudent use of the returns or savings from exhaustible resources rather than the fact of the depletion of these resources".

Strong sustainability. This approach differs from the previous approach in the following ways. It assumes that:
(a) the natural world is finite, non-growing and materially closed.
(b) economic growth, as based on the neoclassical approach, is becoming unsustainable.
(c) the "full-world" scenario suggests that an economy cannot continue to function without natural capital and that human and natural capital are complements.
(d) sustainability implies non-declining natural capital.

The safe minimum standard (SMS) approach. This approach is a "middle way" between the two previous approaches. Because of uncertainty about or a lack of information on the impact of human activity on the natural environment, the SMS focuses on the irreversibility and the potential social opportunity cost of human activity. The SMS is a hybrid between the weak and strong sustainability approaches. Where the influence of human activity on the natural environment is superficial, the weak sustainability approach is favoured, but when uncertainty

and the social opportunity cost are high, the strong sustainability approach should be favoured.