

Environmental Economics - A Review

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ABSTRACT

Environmental economics is an area of economics that studies the financial impact of environmental policies. Environmental economists perform studies to determine the theoretical or empirical effects of environmental policies on the economy. This helps governments design appropriate environmental policies and analyze the effects and merits of existing or proposed policies. Environmental economics studies the impact of environmental policies and devises solutions to problems resulting from them. Environmental economics can either be prescriptive-based or incentive-based. A major subject of environmental economics is externalities, the additional costs of doing business that are not paid by the business or its consumers. Another major subject of environmental economics is placing a value on public goods, such as clean air, and calculating the costs of losing those goods. Since some environmental goods are not limited to a single country, environmental economics often requires a transnational approach.

KEYWORDS: *economics, policies, environmental, consumers, goods, country, transnational, consumers*

INTRODUCTION

The basic theory underpinning environmental economics is that environmental amenities (or environmental goods) have economic value and there are costs to economic growth that are not accounted for in more traditional models. Environmental goods include things like access to clean water, clean air, the survival of wildlife, and the general climate. Although it is hard to put a price tag on environmental goods, there may be a high cost when they are lost. Environmental goods are usually difficult to fully privatize and subject to the tragedy of the commons. Destruction or overuse of environmental goods, like pollution and other kinds of environmental degradation, can represent a form of market failure because it imposes negative externalities. Environmental economists analyze the costs and benefits of specific economic policies that seek to correct such problems, and they may run theoretical tests or studies on the possible consequences of these policies.[1,2] Environmental economists are concerned with identifying specific problems, but there can be many approaches to solving the same environmental issue. If a state is trying to impose a transition to clean energy, for example, they have several options. The government can impose a fixed limit on carbon emissions, or it

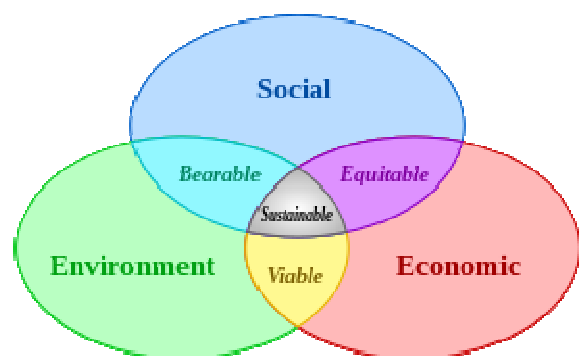
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can adopt more incentive-based solutions, like placing quantity-based taxes on emissions or offering tax credits to companies that adopt renewable power sources. All of these strategies rely on state intervention in the market, but some governments prefer to use a light touch and others may be more assertive. The degree of acceptable state intervention is an important political factor in determining environmental economic policy.



Broadly speaking, environmental economics may produce two types of policies:

Prescriptive Regulations

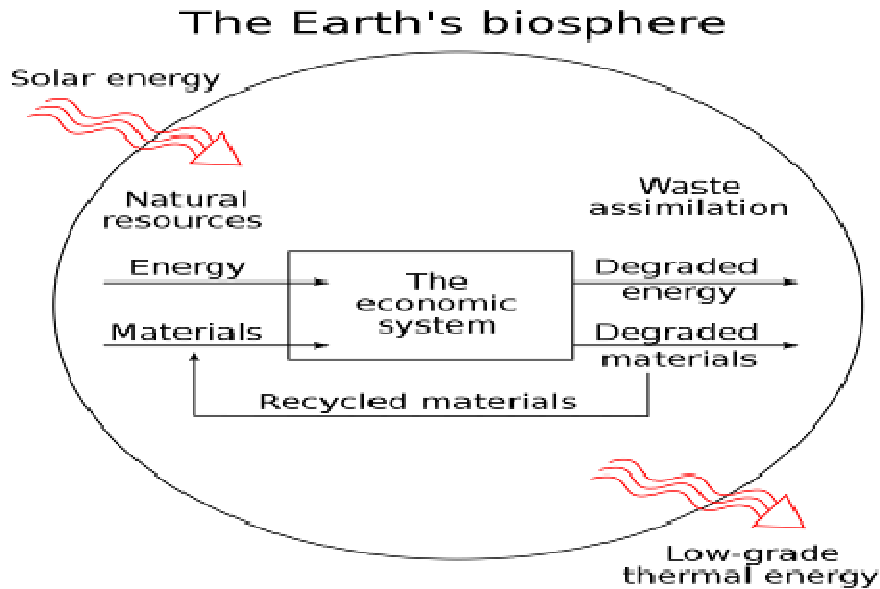
In a prescriptive approach, the government dictates specific measures to reduce environmental harm. For example, they may prohibit highly-polluting

industries, or require certain emissions-controlling technologies.

Market-based Regulations

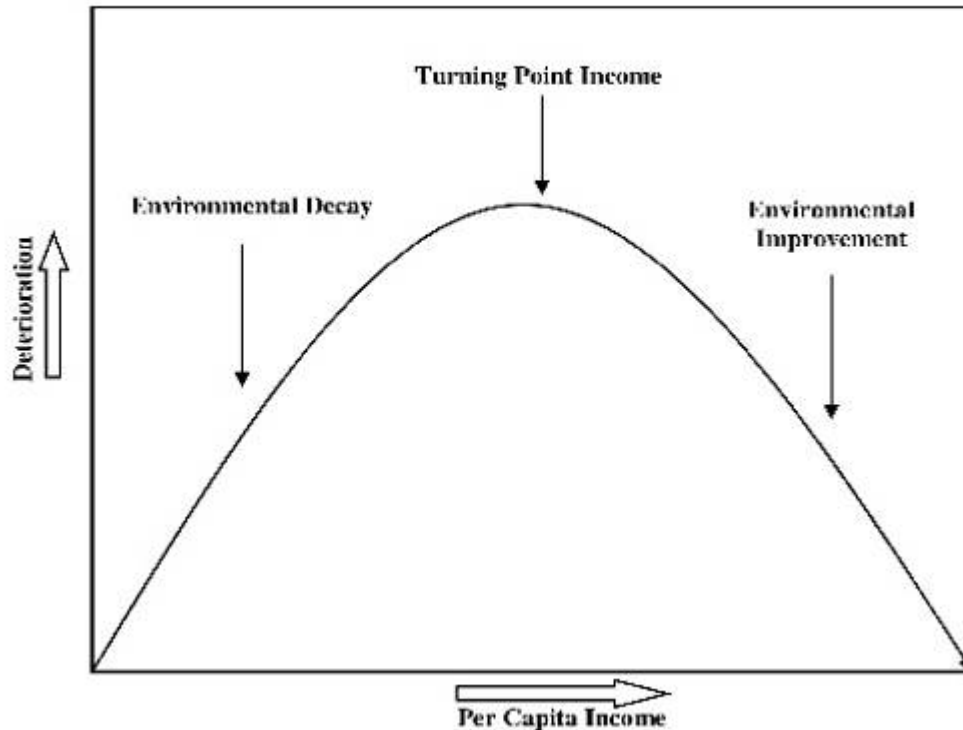
Market-based policies use economic incentives to encourage desired behaviors. For example, cap-and-

trade regulations do not prohibit companies from pollution, but they place a financial burden on those who do. These incentives reward companies for reducing their emissions, without dictating the method they use to do so.[3,4]



Because the nature and economic value of environmental goods often transcend national boundaries, environmental economics frequently requires a transnational approach.

Environmental Kuznets Curve



For example, an environmental economist could identify overfishing as a negative externality to be addressed. The United States could impose regulations on its own fishing industry, but the problem wouldn't be solved without similar action from many other nations. The global character of such environmental issues has led to the rise of non-governmental organizations (NGOs) like the Intergovernmental Panel on Climate Change (IPCC), which organizes annual forums for heads of state to negotiate international environmental policies. Another challenge of environmental economics is the degree to which its findings affect other industries. More often than not, findings from environmental economists can result in controversy, and their policy prescriptions

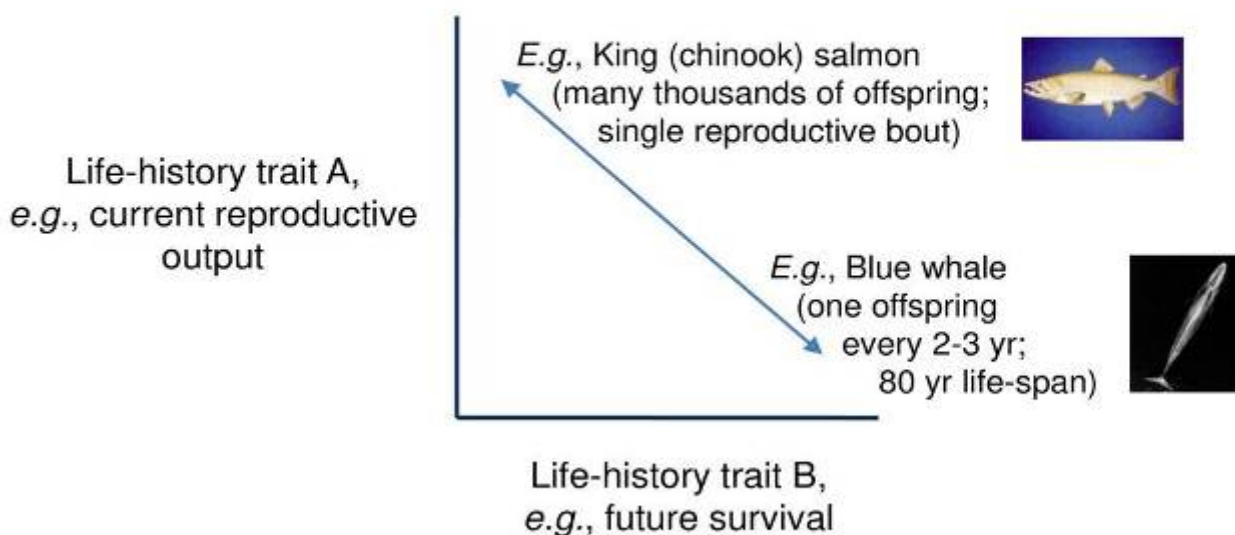
may be difficult to implement due to the complexity of the world market. [5,6] The presence of multiple marketplaces for carbon credits is an example of the chaotic transnational implementation of ideas stemming from environmental economics. Fuel economy standards set by the Environmental Protection Agency (EPA) are another example of the balancing act required by policy proposals related to environmental economics. In the U.S., policy proposals stemming from environmental economics tend to cause contentious political debate. Leaders rarely agree about the degree of externalized environmental costs, making it difficult to craft substantive environmental policies. The EPA uses environmental economists to conduct analysis-related policy proposals. These proposals are then vetted and evaluated by legislative bodies. The EPA oversees a National Center for Environmental Economics, which emphasizes market-based solutions like cap and trade policies for carbon emissions. Their priority policy issues are encouraging biofuel use, analyzing the costs of climate change, and addressing waste and pollution problems[7,8]

Discussion

A prominent contemporary example of the use of environmental economics is the cap and trade system.

Environmental Economics

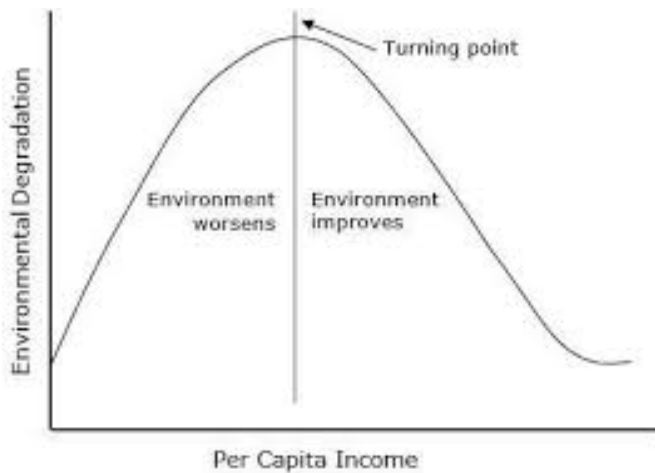
Interesting parallel with organismal **life-history evolution**;
 "a jack of all trades is master of none"



Photos from Wikipedia

Companies purchase carbon offsets from developing countries or environmental organizations to make up for their carbon emissions. Another example is the use of a carbon tax to penalize industries that emit carbon. Corporate average fuel economy (CAFE) regulations are another example of environmental economics at work. These regulations are prescriptive and specify the gallons per mile of gas for cars for car makers. They were introduced during the 1970s to promote fuel efficiency in an era of gas shortages. Environmental and ecological economics are both sub-fields of economic thought that study the interactions between human activity and the natural environment. The difference is that environmental economics studies the relationship between the environment and the economy, while ecological economics considers the economy to be a subsystem of the wider ecosystem. Neoclassical economics is a broad theory that focuses on supply and demand as the driving forces of economic activity. Environmental economics is based on the neoclassical model but places a greater emphasis on negative externalities, such as pollution and ecosystem loss.[9,10]

Environmental economists may find ready employment at the Environmental Protection Agency, or other environmental bodies at the state or local level. These specialists are responsible for enforcing regulations to protect the environment and calculating the economic costs of enforcing regulations.



The origins of environmental economics date back to the 1960s, when industrialization was experiencing a boom, particularly in the western world, and pollution from industrial activity became an increasing concern. Environmental activism also started to increase due to the perceived negative consequences of environmental degradation. The world became aware of rapid economic growth and its consequences to the environment. Environmental economists see the environment as a form of natural capital that provides amenities and life support functions to the earth's inhabitants. Environmental economics was premised on the neoclassical approach dealing with issues such as inefficient natural resource allocation, market failure, negative externalities, and management of public goods. As the movement developed over time, other intricate details on the relationship between the environment and the economy became apparent. The study brought about powerful environmental arguments and propositions, which gave rise to contemporary environmental policies and regulations around the world. It led to the establishment of new environmental bodies – chief among them, the United Nations Environment Programme (UNEP) in 1972.[11,12]

Scope of Environmental Economics

The role of environmental economics in the design of environmental policies and their implementation is the major concern of the discipline. Three important questions arise in environmental economics:

- What causes environmental challenges in terms of economic and institutional affairs? The question explores the concept of market failure, which is premised on the fact that there are either non-existence or incomplete markets for environmental goods, such as unpolluted air, clean environment, scenic nature views, etc.; hence, there is likely to be no efficient allocation of environmental resources.
- What is the monetary value of environmental degradation through pollution and other agents, as

well as the value of developments in the prevention and eradication of environmental harm? The methods of measurement and estimation of the variables are an important aspect of environmental economics.

- How can economic incentives and environmental policies be effectively designed to improve environmental quality and deter environmental damage? Critical evaluation of economic incentives and environmental policies and regulations is crucial to find out if they are yielding the intended objectives.

Environmental economics encompasses the following concepts:

1. Sustainable Development

Sustainable development is defined by UNEP as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” The concept analyzes the role of economic development in supporting sustainable development.

The four basic components of sustainable development are economic growth, environmental protection, social equity, and institutional capacity.

2. Market Failure

Market failure occurs if the functioning of a perfect market is compromised; hence, it is unable to efficiently allocate scarce resources at a given price as conditions for laws of demand and supply are not met.

An example can be an environmental good such as clean oceans. It is difficult to price the value of clean seas and oceans, and there exist no markets for clean water bodies where it is traded depending on the degree of cleanliness. It is a standard case of market failure.[13,14]

3. Externalities

Externalities are inadvertent consequences of economic activity that affect people over and above those directly involved in it. Externalities are also another form of market failure. They can either be negative or positive.

A negative externality creates unplanned outcomes that are harmful to the environment or directly to the general public. An example can be pollution through industrial production, which results in unclean air and water and other health risks. The polluting entities may not incur any costs to address the pollution, even though their activities harm the environment and negatively affect the surrounding community.

A positive externality is a benefit to other people not directly involved in its generation. A community

nature park can benefit people outside the community who visit family and friends in the area and would not have contributed to its development. People who benefit from an economic resource without contributing to its establishment are called “free riders.”

4. Valuation

Valuation is an important aspect of environmental economics, as it helps to evaluate a variety of options in managing challenges with the use of environmental and natural resources. The valuation of ecological resources is a complex process, as it is difficult to assign value to intangible benefits, such as clean air and an unpolluted environment.

Resources that offer multiple benefits are difficult to value – for example, mountains may prevent flooding, provide scenic beauty, direct river flow patterns, and provide fertile soils for agriculture.

Environmental resources can be assigned values depending on use and non-use methods. It's easier to assign value to a product in use by observing what consumers are willing to pay.

Opportunity cost pricing, replacement cost, and hedonic pricing techniques can be employed in the “use” method. The contingent valuation technique is used for the “non-use” method by measuring what consumers are willing to pay for a product they do not use or enjoy.

5. Cost-Benefit Analysis

Cost-benefit analysis (CBA) involves weighing the benefits arising from a policy against the perceived benefits. Hence, the best policy is one in which there is the greatest surplus of benefits over costs.

CBA starts with a base policy where no changes are made to the status quo. A time horizon is selected where the perceived costs and benefits are expected to be realized. Benefits are instances where human well-being is improved, and costs decrease human well-being.[15,16]

Costs and benefits to be realized in the future are discounted using a discount factor to cater to the time value of money. Benefits include extra income, improved quality of life, clean water, and beaches, and costs include opportunity costs, internal and external costs, and externalities.

Results

Environmental economists research the economics of environmental issues such as renewable energy use, construction of new hydroelectric power plants or transnational pipelines, and pollution control measures. They may conduct cost-benefit analyses of industrial activities or proposed regulations involving

natural resources, usually using a suite of advanced statistical and computer software programs. They may also run sophisticated environmental modeling programs. Based on these analyses, they may develop cost-effective and sustainable policy recommendations, and communicate them to policymakers through reports and presentations.

Environmental economists may study or develop policy recommendations relating to:

- Externalities, or unintentional effects on the environment or human health resulting from economic activity
- Permit trading, also referred to “cap and trade”. This approach was successfully used to address acid rain in the 1990s. It's also been proposed as a policy tool to address release of the greenhouse gases that cause global warming.
- Cost-benefit analysis of environmental regulations
- The economics of biofuels, waste management, land cleanup and other environmental technologies and industries
- Valuation, which aims to assign dollar values to natural resources. Valuation also deals with nature-provided “ecosystem services”, such as erosion prevention by trees or water filtering by plants.[17,18]

Like all subdisciplines of economics, environmental economics borrowed heavily from thought of its precursors. The idea of an externality, a detrimental (or beneficial) effect to a third party for which no price is exacted, was already familiar from the work of Pigou in the 1920s. Pollution damage fitted neatly into this framework. Polluters cause damage to third parties but may not be required to pay for that damage. Because market-oriented economic systems did not account for externalities (any more than planned ones such as the former Soviet Union did in practice), those systems could not be maximizing human well-being. Intervention in some form to internalize the externality—to get the third-party effect included in the internal costs of the polluter—was justified.

That policies could be evaluated in terms of their costs and benefits, with costs and benefits defined in terms of human preferences and willingness to pay, was established by Dupuit in the nineteenth century . The body of modern-day welfare economics was established by Hicks, Kaldor, and others in the 1930s and 1940s. Practical guidelines for using welfare economics in the guise of cost-benefit analysis were drawn up first for the water sector in the United

States. Considerable attention was also being devoted to the wider issue of efficiency in government, especially military spending, by bodies such as the Rand Corporation. In 1958 three seminal works appeared: Eckstein's Water Resource Development, Krutilla & Eckstein's Multipurpose River Development, and McKean's Efficiency in Government Through Systems Analysis. The feature of these works was the synthesis of practical concerns with the theoretical welfare economics literature. The essential step was the justification for the benefit-cost principle: justifying projects or policies on the basis that benefits exceed costs is wholly consistent with there being losers, i.e., those who suffer the costs. The Kaldor-Hicks compensation criterion had established that projects were nonetheless justified because gainers could compensate losers, such that losers would be no worse off, and gainers would still have a net benefit. This implies that, provided the compensation takes place, no one is actually worse off, thus meeting the long-established Pareto criterion for an improvement in overall well-being. However, actual compensation need not occur: It is necessary only that it could take place.

In a separate strand of intellectual development, the idea that any natural resource had some optimal rate of use had been established formally by Gray in the early twentieth century and later by Hotelling. Initially, these optimal use theorems were confined to natural resource economics as opposed to environmental economics. The distinction between the two was that the former was mainly concerned with rates of exhaustible resource depletion and the determination of optimal harvest rates for renewable resources. Environmental economics, on the other hand, focused on pollution. The distinction largely broke down once it was recognized that theorems from the former were applicable to the latter contexts, especially where pollutants were cumulative, and also in the context of the theory of optimal economic growth. The growth theory contributions culminated in elegant if demanding treatises in the 1970s, e.g., Dasgupta & Heal. Mathematical models of economies with single exhaustible natural resources were in turn stimulated by real world issues. In 1973 the first Organization of the Petroleum Exporting Countries' (OPEC) oil price increase occurred, which prompted concerns about the stability of fossil fuel-dependent economic systems. The optimal use rate for a renewable resource, such as a fishery, was the subject of a separate literature dating mainly from Gordon's 1954 paper on fisheries as a common property resource. Gordon also explained why a fishery faced with open access, i.e., totally absent

property rights as opposed to common property where rights exist for a defined community, could be exploited to the point where all economic rents were dissipated. By implication, if certain other conditions are present, open access may be consistent with extinction of the resource. Interestingly, the paper that commanded substantially more attention for saying the same thing (although confusing common property and open access) was Hardin's 1968 paper "The Tragedy of the Commons". Hardin is a human ecologist, and "Tragedy" has been one of the most reprinted articles in the environmental literature.[19,20]

Conclusions

The Environmental Economics and Management (EEM) program prepares you for a career that requires balancing environmental sustainability and economic development goals. The major is a broad, integrated study of environmental economics, public finance, economic development, community and regional studies and environmental science. [21]

The major also offers students the opportunity to prepare for graduate study in environmental economics or environmental policy studies programs.

Core areas of study include:

- Economic analysis.
- Basic environmental science.
- Environmental law and policy.
- Micro- and macroeconomics.

Environmental economists and policy managers are in high demand, and an increasing amount of pressure is applied on environmental issues.

Environmental and Economics Management prepares students for a variety of career paths.

- Environmental consultant.
- Environmental economics analyst.
- Environmental or industry lobbyist.
- Land conservancy director.
- Legislative assistant.
- Resource management specialist.

Faculty members and advisors maintain close relationships with environmental economics professionals, which can help with internships, scholarships and employment in environmental economics and management fields.[22]

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