



RELATIONSHIP BETWEEN ENVIRONMENT AND SUSTAINABLE ECONOMIC DEVELOPMENT: A THEORETICAL APPROACH TO ENVIRONMENTAL PROBLEMS

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ABSTRACT

Introduction: Environmental pollution is the major facing by every country. Natural resources are depleting rapidly, creating scarcity problem for the next generation. A large number of population particularly poor segments of societies are suffering badly. On the one hand, every country is trying to increase economic growth to alleviate living standard of their people and on the other hand, environmental problems are becoming complicated due to excessive use of resources.

Objective: The objective of this paper is to study the relationship between environment and sustainable economic development. Another objective is to study how sustainable economic development can be achieved? How can environmental degradation be controlled?

Methodology: The methodology of the study is descriptive in nature because it mostly involves the description of environmental issues and suggesting the ways how they can be solved? However, different statistical techniques such as trend and content analysis have been used to measure the impact of environmental pollution.

Data and Source: The author used secondary data in this study because it was not possible to collect primary data due to geographical constraints. The was taken from World Bank, IMF, Asian Development Bank, Indian Ministry of Environment and Forests, United Nations Environment Program, Economic Survey of Pakistan, relevant research journals and books.

Findings: The findings of the study are robust because the author has found that both developed and developing countries are responsible for environmental hazards. The developed countries are using excessive resources to produce surplus goods for exports while poor countries are exploiting their existing resources to feed their growing population and end poverty level. This race of resources exploitation has created a dangerous situation all over the world and has made the lives of people and animals vulnerable. The author concludes that judicious use of environmental resources is an imperative need for sustainable economic development.

Keywords: Environmental hazard, Municipal wastes, Forestation, Degradation, Earth's Eco system.



INTRODUCTION

The concept of “environment” has evolved since it started to become a global issue in the early 1970s. At first, it was a kind of global recognition that the Earth’s ecosystems are in fact fragile, and that human beings have been contributing much to its degeneration. When countries started to join efforts to strike a balance between improving the quality of human life and protecting the environment for the sake of future generations, a new awareness materialized. The social and economic welfare of human beings is closely linked to their environment. Any change in the socio-economic fields will have an impact on the earth’s environment and vice versa, whether positively or negatively, immediately or eventually. And in many cases, negative results are irreversible. The Earth Summit held in Rio in 1992 concluded that the economic, social and environmental concerns are inescapably interlinked to world development. Hence it pledged to eradicate environmental problems, reduce poverty and foster: Sustainable development through integrated efforts and global cooperation.

Environmental Resources

Environmental resources are those that have intrinsic value of their own or are of value for the longer term sustainability and use by humans. In strictly economic terms, environmental resources to a large extent are ‘non-tangible’. Social and human resources are defined in terms of density of population groups, their occupational activities, their land rights, their source of income, their standard of livings, gender aspects, etc. One of the major global problems is that the present rate of global resources utilization. Ever increasing population raises the demand for sufficient resources to meet the demands for future generation. Here we describe four types of human, environmental and natural resources in collective terms.

TYPES OF RESOURCES

There are four types of resources that are renewable, non-renewable, extrinsic and continuous resources:-

Renewable Resources

These resources are capable of natural regeneration into useful products within a reasonable time span. These have the potential to renew themselves and be indefinitely available as long as their capacity to regenerate is not interrupted by natural catastrophes. For example, clean water, clean air, soil, flora and fauna.

Non-Renewable Resources

These resources are available only in finite amounts or else the rate of their renewable is so slow that they are regarded as available on in fixed quantities. For example, ground water, minerals, etc.



Continuous Resources

These resources are available and with the possible exception of solar energy, the receipt of which could be affected by atmospheric pollution, cannot be degraded even with gross mismanagement. For example, solar energy, wind, gravity, tidal energy and geothermal energy.

Extrinsic Resources

These resources are prone to breakdown or degradation, yet are available continuously if managed properly for example, human skill, institutions' management abilities, etc.

Environmental Indicators

Although the social, economic and environmental indicators are inter-linked to much an extent there are some specific environmental indicators through which we can measure the level of development of a country. These environmental indicators are the followings:-

1. Number of clean air days.
2. Minimum level of waste.
3. Nature-based environmental designs.
4. Percentage of population using potable water.
5. Percentage of population using sewers.
6. Percentage of population using public transport or carpooling.
7. Percentage of prime agriculture land.
8. Percentage of households participating in recycling programmes.
9. Tons of hazardous waste generated annually.
10. Tones of per capita of solid waste generated annually.
11. Tons of toxic release annually.
12. Number of institutions dealing with environmental issues.
13. Number of environmental education classes in public and private academic institutions.
14. Legal environmental structure.
15. Awareness among the people about collective benefits of clean environment.
16. People sensitivity to pollutions.
17. Nature of waste management system.
18. Budgetary allocation for environmental projects.
19. Volume of the use of chemicals and chemical fertilizers.
20. Level of health hazards.

Environment and Sustainable Development

There is close link between environment and sustainable development which is used in the broad perspective and the overall development of human beings without any distinction. The World Conservative Strategy initiated by the United Nations Environment Programme (UNEP), the world wide Fund for Nature (WWF) and international Union for Conservation of Nature (IUCN), provided the platform for international debate on sustainability. The most noteworthy step towards



sustainable development is the publication of an international report titled “Our Common Future” by World Commission on Environment (WCED) in 1987. This is commonly known as “The Brundtland Report “.The report defined sustainable development as “Development that meets the needs of the present, without compromising the ability of future generations to meet their own needs”.

According to this report, the major objective of development should be to ensure the satisfaction of human needs and aspirations of a material kind. It emphasized the fact that over exploitation of resources may compel human societies to compromise their ability to meet the essential needs of their people in future. Settled agriculture, the diversion of watercourses, the extraction of minerals, the emission of heat and noxious gases into the atmosphere, commercial forests, and genetic manipulation, were all mentioned in the report as examples of human intervention in natural system during the course of development. It called upon all countries to adopt the objective of sustainable development as the overriding goal and test of national policy and international cooperation.

Three Earth Summits were held under the auspicious of United Nations Conference on Environment and Development (UNCED) in 1992, 1997 and 2002. Over 170 countries participated in these Summits renewed their commitment to sustainable development aiming at “ giving special attention to the worldwide conditions that pose severe threats to the sustainable development of the people, which include: chronic hunger; malnutrition; foreign occupation; armed conflict; illicit drug problems; corruption; natural disasters, communicable diseases, in particular HIV/AIDs, malaria and tuberculosis”.

After these Summits, the sustainable development has become a universal theme to describe the amalgamation of environmental opportunities and human wisdom.

DIFFERENT DIMENSIONS OF SUSTAINABLE DEVELOPMENT

Sustainable development has many dimensions. Some of them are briefly described in the followings:-

Social Dimension

- * Workers’ health and safety.
- * Impact on local communities, quality of life.
- * Benefits to disadvantaged groups, for example, the disabled.

Economic Dimension

- Creation of new markets and opportunities for sales growth.
- Cost reduction through efficiency improvements and reduced energy and raw material inputs.
- Creation of additional value.



Environmental Dimension

- Reduced waste, effluent generation, emissions into environment.
- Reduced impact on human health.
- Use of renewable raw materials.
- Elimination of toxic substances.

The development has different nature which deals with the welfare of human being and its ultimate goal is his amelioration. The sketch of different nature of developments is given below:-

1. Spiritual Development- It deals with the religious and moral values.
2. Human Development- It deals with Society and social structure.
3. Economic Development- It deals with the Economy and Economic System.
4. Political Development- It deals with the Government and political system.
5. Cultural Development - It deals with the Culture, Customs, Traditions and norms.
6. Ecological Development- It deals with the Nature (Environment).

How to Achieve Sustainable Development

There are certain mandatory conditions and requirements to achieve the objectives of sustainable development. These conditions can be met by giving empowerment to the following sections of society.

1. Women
2. Children
3. Youth
4. Indigenous people and their communities.
5. Non-governmental organization
6. Local authorities
7. Workers and trade unions
8. Business and industry.
9. Farmers.
10. Scientific and technological organizations.

Environmental Interdependence

The Environmentalists all over the world has emphasized the need for maintaining environmental quality through sustainable use of resources. All human activities designed and implemented for the economic growth of a country and the social needs would have directly or indirectly impact on environment. The qualitative and in some cases quantitative change in water, land and other resources have the same effect across the world. Unlike social and economic sectors, environmental concerns are similar in both developed and developing countries as the citizens of all countries must have access to clean water, air, safe drinking water and sufficient supplies of clean renewable energy. Furthermore, all industrial and agricultural activities depend on common environmental resources as land, soil, forests, ocean, rivers, mineral deposits, etc...



Some environmental issues are highly localized, whereas some others are cross-regional and some are global. For instance, wastes disposed into water courses in one country may have negative impacts on the health and the economics of the people living in downstream countries. Similarly, emissions of ozone depleting substances in one country may be transmitted in the atmosphere and brought effect on the health and agriculture of the countries located hundreds of miles away. The continued dependence of all countries on natural resources highlights the fact that greater cooperation and coordination are necessary among the nations regionally and globally to address environmental problems because environmental issues are inextricably linked to economic issues such as poverty.

Poverty compels the people to indulge in destructive activities like cutting trees to use wood as fuel, use agriculture land excessively, over-exploit water resources and avoid availing health-improving services. Similarly, environmental issues originate from social factors. For example, population increase leads to the excessive use of natural resources in order to provide basic needs such as housing, healthcare, sanitation, safe water, education, food and electricity.

International Trade and Environmental Problems

Here we study the importance of property rights in the context of international trade. Suppose a model of two identical countries, both with same inputs and outputs, and with the same endowments, technologies and preferences. The two countries engaged in free trade in unregulated and competitive markets. The countries differ only in the pattern of ownership of an environmental resources used an input to production. We consider in this case demonstrating that lack of property rights alone can create trade and that trade cans itself worse the common property problem. No trade is necessary for efficiency when two countries are identical, yet trade occurs when they have different property rights regimes. In this context, we establish two general propositions. First, the country with ill-defined property rights observe the environment as an input to production and these ill-defined property rights by themselves create a motive for trade between two otherwise identical countries. Second, for the country with poorly defined property rights, trade with a country with well-defined property rights increases the overuse of resources and makes the miscalculation worse, transmitting it to the entire world economy. Trade equalizes the prices of traded goods and factors worldwide, but this does not improve resources allocation. In the resulting world economy, resources are under-priced there is overproduction by one country and over-consumption by the other. The debate created after Lawrence Summer's leakage of a World Bank's document about whether the developing counties have a comparative advantage in "dirty industries". If so, it is not efficient that they specialize in "dirty industries" and environmentally intensive production. The apparent comparative advantage are not truly comparative advantage because they do not have relative abundance of resources, nor having differences in productivity preferences, nor lower factors prices but they just lack of property rights for a common property resources, which a historical and institutional phenomenon. In this context, the developing countries produce and exports environmentally intensive goods to a greater degree that is efficient



and at prices that are below social costs. Thus, Developing countries are not made better off by specializing in “dirty industries” or the world better off if they do. This approach is also against Pareto optimality welfare concept.

Trade-off between Economic Growth and Environment

There is tradeoff between economic growth and environment because of desire to high growth and excessive use of resources that cause environmental pollution. Poor people and poor countries depend on the soil for food, the rivers for water and forests for fuel. Because they need these resources desperately, they have little choice, without assets or income, but to overuse them and to destroy their natural environment simply to survive.

In doing so, they threaten their health and lives of their children. As the income and consumption levels of the poor increase there is likely to be net increase in environmental destruction. Meeting increasing consumption demand while keeping environmental degradation at a minimum is an uphill task. As the poor countries desire more economic growth they will use more available natural resources resulting in environmental degradation. Economic growth is vital for giving more options to poor societies, but their models of development must become less energy intensive and more environmentally sound. For industrial countries, too, stopping growth or even seriously slowing it is not much of an option for protecting the global environment. Their slower growth would imperil growth in the poor nations, which are dependent on the markets of the rich nations. Moreover, their continuing growth is needed to generate new environmentally safe technologies and extra margin of resources needed for transfer to poor nations. But the growth models of industrial nations must change drastically. The current quantity of growth should be replaced by quality. In order to create balance between economic growth and environmental degradation it is necessary to break the cycle of poverty and environmental destruction in the less developed countries (LDCs). However, the earning capacity of under-developing countries (UDC) is continuously declining due to protectionism of the Developed Countries (DCs). According to the United Nations estimate of 2001, annual losses of the developing countries due to lack of access to the goods markets of the developed countries were more than double the total amount of aid received in 2000 from all resources. If lack of access to capital and labour markets is included the total annual losses will be about \$500 billion. In addition to trade barriers, the industrialized countries are penalizing the poor developing countries by heavily subsidizing their own agricultural sectors, which is estimated to be around \$300 billion per annum. The industrialized countries must change their policies to enable the less developed countries to break vicious circle of absolute poverty (Haq, 1999).

Impact of Externalities on Environment

The moral of the above example is that people tend to maximize their personal welfare, balancing private benefits against private costs. By continuing electricity generation through cheap coal, in fact, is an act of imposing costs on others in the form of air and water pollution. These costs are



external to the firm and do not appear on its profit and loss statement. Those external costs or externalities are not less real, but they are born by society at large rather by the firm itself. Whenever external costs exist, a private firm will not allocate resources. In effect, society is permitting the power plant to use valued resources, clean water and clean air at zero cost. The efficiency of this market arrangement can be expressed in terms of a distinction between social costs and private costs. Social costs are the total costs of all the resources used in a particular production process. Private cost, on the other hand, is the resources costs incurred by the specific producer. When social costs differ from private costs, external costs exist and are, in fact, equal to the difference between the social and private cost; that is,

$$\text{External costs} = \text{social costs} - \text{private costs}.$$

When social costs exist the market mechanism will not allocate resource efficiently and attainment of social welfare will be difficult. In short, if pollution costs are external, firms will produce too much of goods and pollute the environment as much as possible. Thus externalities affect the environmental negatively.

Environmental Models

The World Bank, European Union, Asian Development Bank and other World and Regional Institutions have funded various empirical studies in different parts of the World to measure the level of environmental problems so that they may be able to frame strategies to combat against them and to chalk out the programmers specially focusing to improve the well-being of more than one billion people of the developing countries facing threats of water and air pollution, which is harmful to human health. Among air pollutants, the scientific consensus attributes most health damage to fine particulate matter (diameter 2.5 microns or less) produced by indoor and outdoor combustion (Holgate *et al.*, 1999).

Recent research has also identified the vulnerability of people on fragile lands (i.e. lands that steeply-sloped, arid or covered by natural forest) as a major determinant of rural poverty and natural resources degradation in developing countries (World Bank, 2003). Approximately 1.4 billion people live on fragile lands that are steeply-sloped, arid or forested and many of these people are poor and there is consensus among researchers and policy-makers that the people on fragile lands bear a high risk of natural resources degradation and improvishment. Heavy incidence of this problem is in South Asia and East Asia. Annual average loss due to deforestation in South and East Asia is 1.2 percent, higher than any other tropical region. An numbers of other studies have explored the relationship between economic development and environmental quality. Theoretical papers by John and Pecchenino (1997) and Selden and Song (1995) have derived paths for pollution, abatement efforts and development under alternative assumptions about social welfare functions, pollution damage, and the cost of abatement and productivity of capital. Empirical studies Hettige (1997), Shafik (1994), Selden and Song (1995) have searched for systematic

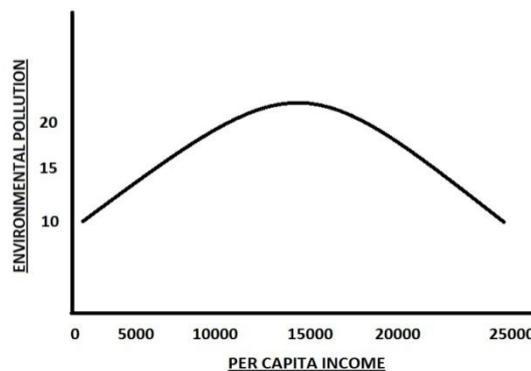


relationship by regressing cross-country measures of ambient air and water quality and various polynomial specifications of income per capita.

Kuznet's Environmental Curve Model

A generation ago, the U.S. economist, Simon Kuznets proposed that income inequality generally rises as development proceeds, falling after the rewards of growth accumulate. Similarly, some researchers have claimed to identify “Kuznets Environmental curve Model”, in which pollution from industry, motor vehicles and households increases until development generates enough wealth to promote significant pollution control. Kuznets based his hypothesis on per capita income. However, there is controversy among the economists about the turning point the level of per capita income of the countries when inequality or environmental pollution starts decreasing. This ambiguity raises many questions: Does pollution follow as “Kuznets’ curve, first rising and then falling as income increase? At what income level does turnaround occur? Do all pollutions follow the same trajectory? Is pollution reduction in developed economies due primarily to structural change or on account of regulation?

Figure-3. Kuznets curve



The empirical results are roughly consistent with a Kuznets curve for conventional air pollutants such as suspended particulates and sulphur dioxide, but the results for water pollution are mixed. Moreover, the hypothetical studies on emission (CO₂) confront Kuznets’ Model on the ground that as per capita income increases the vehicular emission also increases because people purchases or use maximum personal cars when their income increases.

Another empirical study that decompose total industrial pollution into three proximate determinants:

1. National output.
2. Share of industry in national output.
3. Share of polluting sectors.

The studies show that declining pollution at higher levels of development must be driven by some combination of income-related changes in the above three factors like the share of industry in

national output, share of polluting sector in industrial output and end-of-pipe pollution intensities in the polluting sectors. The econometric results that measured overall economic development on industrial water pollution does not have an overall inverse U-shaped relationship between income and the above three factors. These factors have different relationship with income and their joint product. With total output is asymptotic, not parabolic. Industrial water emissions rise until countries attain middle income status, and then remain approximately constant as they grow richer. The results suggest that pollution and labor intensities with respect to output decline continuously and at almost exactly the same rate as income increases. The sectoral pollution/labor ratios remain approximately constant during development process. However, Kuznets hypothesis for industrial water pollution do reveal a striking regularity in cross-country environmental performance.

Mehboobul Haq's Model

This model has novel idea. It is based on sustainable development model that focus on the people as their primary concern, incorporate new environmentally safe technologies into all investment planning and seek ways to reflect the scarcity value of environmental resources in decision-making. This model stands on five pillars:

First, the model must place the people at the center. Environmental protection may be vital, but it is not to end in itself. Like economic growth, it is a means. The primary objective must be to protect human life and human options. Every environmental measure must be tested against how much it adds to the human welfare of the majority of the world's population. In other words, we must opt for human development.

Second, the model must be based on environmentally sound technologies, particularly energy. By opting clean energy technology (natural gas, unleaded fuel, clean coal technologies and natural gas, etc.) we can reduce emissions of particulates by 99 percent. The consumption pattern of energy must be changed. For example, energy consumed in kilograms of oil equivalent per \$100 of GNP is 13 in Japan, 18 in Germany, 35 in the United States, 50 in Canada, 187 in China, 132 in India. If only all industrial countries increased their energy efficiency to Japan's level, world energy consumption would drop by 36 percent. New technologies and new pattern of production can thus drastically reduce energy inputs per unit of output and curtail the environmentally damaging emissions from each unit of energy used. Third, powerful incentives are needed for economic agents to reflect the correct value of the environment in all decision-making. A mechanism must be evolved for the pricing of environmental resources.

Fourth, sustainable development model must be participatory and community-based. They must mobilize all sectors of civil society because everyone has something valuable to contribute. They must ensure control by local communities over their natural resources. They must draw on local wisdom, experience and traditions, pasture lands, fisheries and wildlife. Unless local communities believe in and contribute to sustainability, all models will be a theoretical exercise. Fifth, the world is generally divided into north and south. The rich nations live in the north while the poor countries



are situated in the south. The north has roughly one-fifth of the world's people but consumes 70% of energy, 75% of metals, 85% of its wood and 60% of its food. To replicate the same material standards in the South would require 10 times the present consumption of fossil fuel and roughly 200 times the mineral wealth. The distribution of global consumption and wealth must undergo a fundamental change. The North is not entitled forever to 85% of global income. Nor can its material consumption pattern be replicated across the entire world. The limited carrying capacity of the planet raises questions about the material life styles of the rich, about simple and less energy intensive life styles all over the world and about a major redistribution of future development opportunities.

Three-Stage Development Model

Some researchers have divided the process of development into three stages to measure its impact on environment. The first stage of economic development typically witnesses the rapid growth of industrial activity and declining environmental quality in densely-populated urban areas. When new industries are pollution-intensive, their emissions can increase local ambient pollutant concentrations to harmful level. The following equation explains this phenomenon in decomposition of total industrial emission in particular region:

$$P = m(y) Q p(y) n(y)$$

Where:

P = total industrial pollution.

m = manufacturing share in total output.

Y = per capita income.

Q = total output.

p = manufacturing pollution intensity.

n = degree of pollution abatement: $0 < n < 1$

This equation include three parameters which we hypothesize to be functions of economic development: the manufacturing share of total output (m), the pollution intensity of manufacturing (p) and degree of pollution abatement by industry (n). In this decomposition, the effect of economic development on pollution depends on the signs and magnetite of parameters governing the relations between m, p, n and y. Numerous studies of the relationship between industrialization and economic development have suggested an inverted-U relationship between manufacturing share of output (m) and per capita income (y). During first phase of economic growth increases as industry expands more rapidly than agriculture. As the economy begins to mature, rapid growth in services becomes the dominant factor and consequently m decline. Some industries have significant effect on sect oral composition of industrial activity on its average pollution intensity, or pollution per unit of output. For example, metal and cement are generally intensive in harmful air pollutants, food and paper production are disproportionate emitters of organic water pollutants [Hettiqe \(1997\)](#). Primary industries like cement, sugar, metal and textiles that convert bulk raw materials into



primary inputs. During development process these primary industries may lose output share to cleaner industries like auto, electronics, instruments, assembling, etc.

Excessive Use of Resources

During the last six decades, the environment has been experiencing tremendous stress due to massive human tampering with the world's interdependence web of life weaved with air, land and water. Coupled with this are the environmental damages inflicted by deforestation, species loss, climatic change and so forth. Excessive and ill-planned use of natural resources has resulted in their quantitative decline. For instance, over-fishing has resulted in reduced catch per effort and consequent change in ecological species balance in several aquatic systems. Over-exploitation of ground water has resulted in scarcity of fresh and clean drinking water in many cities. In coastal areas unscientific exploitation of groundwater has been the cause of sea water intrusion and Stalination. Large scale deforestation has caused the loss of biodiversity including economically important plant and animal species. Massive loss of vegetation has led to soil erosion and degradation of soil quality in downhill regions. Increase in the rate of sedimentation in stagnant and flowing water bodies is another impact of deforestation. Industrialization has raised serious environmental issues such as eutrophication of aquatic systems, global warming, ozen depletion and climatic change.

Role of Developed Countries Inenvironemtnal Pollution

It is worth-mentioning that only one country of the world, United States, which has only 2 percent population of the world, uses 25 percent of resources. The same fact is about the European countries which has small population but exploiting extensive resources. So the countries using more resources are generating more chemical and other wastes and hazards. However, in order to keep their environment safe and avoid strict laws the developed countries are exporting their environmental hazards to developing countries in the following ways.

Shifting of Dirty Industries

As the environmental laws prohibit the existence of industries generating pollution these developed countries are shifting these industries and chemical hazards illegally to the developing countries. In 1992 The Economist magazine, leaked a memo written by World Bank Chief Economist, Lawrence Summers, which discussed the economic rationale of "encouraging more shifting of dirty industries like ship breaking to less developed countries (LDC) like Pakistan, India and Bangladesh where 90 percent of world's ships are dismantled. According to an estimate, there are about 45000 ships in the seawater and around 700 become obsolete every year and needed disposal .Until 1970s, ship breaking was the countries of origin but increasing environmental regulations and heavy labour cost resulted in shifting such industries to less developed countries.

According to ILO, material typically released during scrapping includes asbestos, lead, arsenic chromates and mercury. The export of these chemicals is the violation of 1992 Basel Convention



that banned the export of toxins. But the developed countries do not care about these international laws and are continuously exporting these human-killing chemicals to less developed countries. According to an estimate, about 365 deaths, One daily, is reported every year during ship-breaking.

Chemical Wastesdumpings

A US Company “Stroller Chemical Co (SSC) had 1000 tons of wastes classified as hazardous under US law due to high level of lead and cadmium. The SSC illegally mixed this waste into fertilizers and without notifying the government, illegally exported it to Bangladesh recently. Furthermore, an American ship named “Flashier” entered the water of Bay of Bengal to dump some hazardous toxic wastes but timely Media’s crying prevented this dumping. According to Medical experts, the chemicals like lead and cadmium are said to cause brain damage and affect growth among children. The dumping of such harmful chemicals into the water endangers wildlife, natural environment and jeopardizes global temperature control system. Chemical wastes endanger the health of human beings and wealth of natural resources.

Electronic-Wastesdumpings

The electronic industry is the fastest growing manufacturing industry in the world and it undergoes rapid product obsolescence. Frequent electronic items are discarded (called E-waste) which has become a fastest growing waste stream in the industrialized world. The growing quantity of E-waste is beginning to reach disastrous proportions and industrialized countries all over the world are just now beginning to grapple with the problem. Countries like USA, Japan, UK, Australia, Kuwait, Saudi Arabia and U.A.E. are dumping their computers scrap wastes. The disposition and recycling E-waste has serious legal and environmental implications when computer waste is land-filled or incinerated it poses significant contamination problems, emitting toxins in ground water as well as emit toxic air.

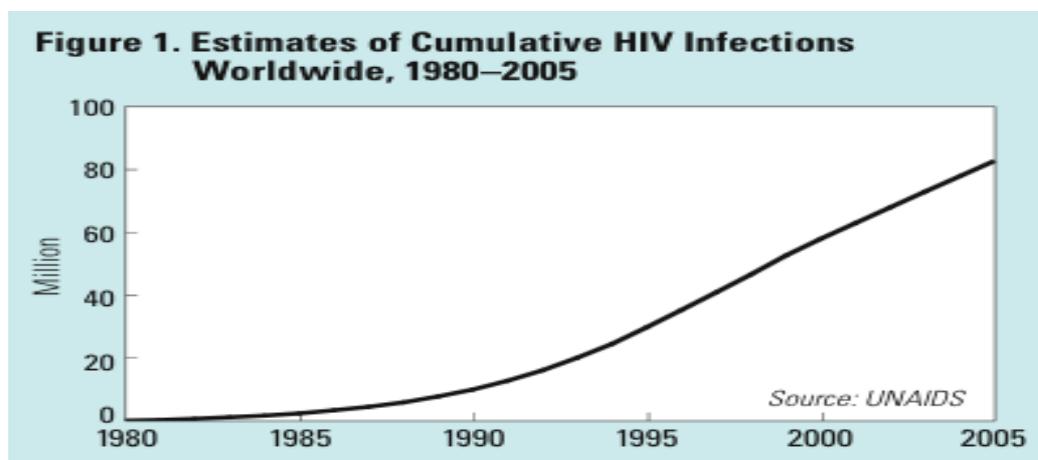
Impact of Environmental Hazards on Human Health

In the introduction we have mentioned the data and alarming growth of Hepatitis in the world during the last 25 years. Paul Russell said that nothing on the earth is more international than diseases. Haq (1999) states that the diseases like Hepatitis move from country to country and continent to continent without passport and without geographical restrictions because health and disease have no political or geographical boundaries. Disease in any part of the world is constant threat to other part. Human history is replete with precedence of the spread of pestilence. It has been observed that HBV is second only to tobacco use as a cause of cancer in human beings (24). Hepatitis B is a gigantic public health menace. Worldwide survey report reveals that approximately 30% of the world population of about 2 billion persons, have serologic evidence of HBV infection out of these, an estimated 350 million have chronic HB infection and at least 1 to 2 million chronically infected persons die each year from HBV related condition.



Hepatitis B is endemic throughout the world. Especially in tropical and developing countries as well as in some regions of Europe, it is spreading widely.. Its prevalence varies from country to country and depends upon a complex mix of behavioral environmental and host factors. Generally speaking, it is lowest in countries or areas with high standards of living (e.g. Australia North America, Europe). It is highest in countries or areas where socioeconomic condition is poor and level of income is lower (e.g. South East Asia, South America, and Africa etc.).It is deplorable and shabby condition that 30 million children each year out of 130 million newly born babies throughout the world have no access to immunization.

World health organization (WHO) has been recommending vaccination against hepatitis B since 1993. But even then it kills approximately one million people each year. In most industrial countries, the carrier rate is less than 1 percent. In contrast, it has been estimated that there are approximately 350 million persistent carriers of HBV out of whom 90 percent live in the developing countries. It means that this disease is a major threat to the masses of developing countries. The research report indicates that hepatitis B virus is affecting 4.5% population of Pakistan. It means that there are more than seven million people. Carriers of HBV in Pakistan. HBV, which is hundred times more fatal and infections than AIDS, every tenth Pakistani is considered the carrier of this disease According to World Health Organization (WHO) Report,2006, nearly 39 million people are living with HIV by 2005 in the world and half of them were women. In parts of Africa and Caribbean, young women (Aged 15-24) are up-to six times more likely to be infected than young men the same age. The main reason is the social factor, i.e.,gender discrimination which denies women the negotiating power they need to reduce their risk of infection. High rate of literacy among women prevent them from knowing the risks of HIV infection and protection strategies. In 2005, approximately 5 million new HIV infections occurred, bringing total number of people currently living with this virus to an estimated to 40.3 million. The Figure 1 highlights the rising trend of HIV at alarming rate since 1980 when it was zero and within a short span of 25 years the number of effected persons have increased to about 80.0 million, which must be point of serious concern.



About 3 million people died of AID-related illness in 2005 out of those nearly 0.6 million were children under 15 years of age. Since the discovery of AID in 1981, the disease has claimed more than 37.1 million people. Sub-Saharan Africa continues to be the region most affected by the pandemic, accounting for 64 per cent of new infections (more than 3 million people) in the last year. The Caribbean is the second most affected region; AID is the leading cause of death. A survey of 24 Sub-Saharan African countries reveals that two thirds or more of young women lack comprehensive knowledge of HIV transmission. The dramatic increase in infection among women heightens the risk of infection among children. Infants become infected through their mothers during pregnancy, childbirths or breast-feeding. In 2005 more than 2 million children under aged 14 years or younger are living with HIV. In short, women are disproportionately affected by poverty, inequality and violence.

Market Incentives and Environment

Here question arises why the individual consumers do and business firms pollute the air, water and land? It is generally assumed that market forces that influence the economic behavior of individual consumers, business firms and government agencies. Primarily the incentives play a basic role in changing the behavior. For example, incentive in the form of price reduction can be used to change consume buying habits while incentive in the form of high profit margins encourage production of desired goods and services. And market incentives in the form of cost differentials help to allocate resources efficiently. Accordingly, it is not surprising to learn that market incentives play a major role in pollution behavior. As it is well-known that thermal power plants are responsible for a significant amount of air pollution (especially sulfur dioxide and particulates) and nearly all water used in thermal power generation are polluted. Suppose you are the owner of a power plant and you will strive to make a profit- maximizing production decision by keeping the marginal revenue equals marginal cost. As we know that the price of electricity is fixed by the public authority at least in the short-run. The following Figure 2 (a) shows the marginal and average total costs (MC and ATC) associated with the production of electricity. By equating marginal cost (MC) to price (marginal revenue, MR), we observe that profit maximization occurs at point A where the plant is generating an output of 1000 Kilowatt hours per day. Total profits are illustrated by the shaded rectangle between the price line and average total cost curve (ATC). This high profit level has been achieved due to using cheapest available fuel (high-sulfur coal, the prime villain in SO₂ Other fuels, such as low-sulfur coal, fuel oil and nuclear reactors that involves high costs.

If the plant is shifted to one of these high cost fuel because of environmental consideration the ATC and MC curves would both shift upward (to MC₂ and ATC₂) as is shown in the Figure 2 (b) ,the profit would shrink to point B and output will also be reduced from 1000 to 800 KWT-hours per day. In such a situation when both profit and output has reduced the big question here is whether a profit-maximizing firm will be willing to incur higher costs in order to cut down or eliminate either air or water pollution emanating from power plant only to benefit those people who live downstream. We do not expect that that profit-maximizing firm to take environmental



concerns into his account because the behavior of profit-maximizes is guided by comparisons of revenue and costs, not by philanthropy, aesthetic concerns or the welfare of others (human beings, animals or plants).

Figure-2. (a)

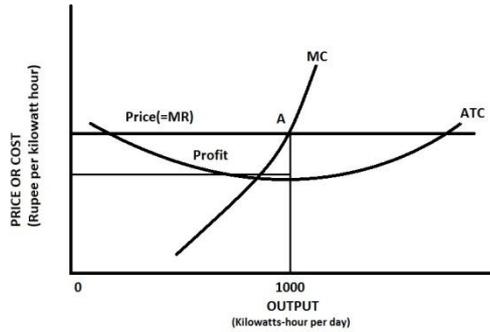
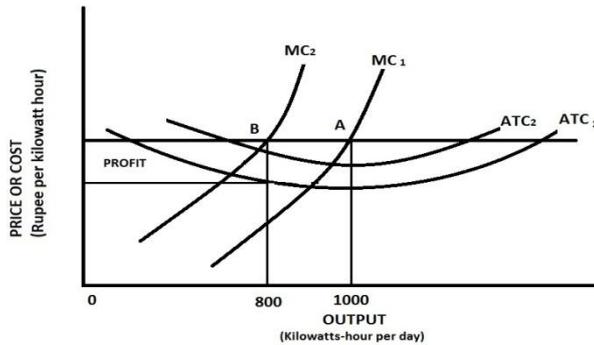


Figure-2. (b)

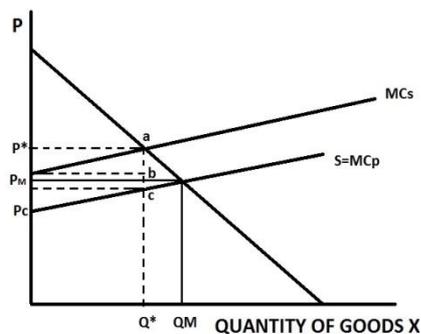


How to Reduce Pollution: Pricing of Environmental Resources

There are many propositions to prevent polluters from polluting environment, but effective method is to assign price to environmental resources. The problem is that the economic agents face difficulty in pricing the environmental resources as well as assessing the correct value of the environment in all decision-making. Markets and private investors often regard the environment as a free resource: its scarcity value is seldom reflected in investment decisions. The only effective way to underscore the value of the environment is to put a price on it. This must be done nationally, by correctly pricing environmental resources, particularly-energy, and by legally binding the polluters to pay for the damage they cause. The levying of pollution tax is suggested as one of the solution of the pricing of environmental resources. We explain it through Figure 1 which depicts the demand and supply curves. The supply curve is labeled as $S = MC_p$ because it represents the marginal private costs associated with producing good X. The free-market equilibrium output and price are Q_m and P_m respectively. If there are externalities associated with the consumption of production of each unit of good X, the MCs curve does not represent the true costs to society of. If each unit of good X imposes a cost of \$2 on third party, we can obtain the true marginal cost curve

MCs by legislating a \$2 per unit sales tax on the output. This pollution tax shifts the private cost curve upward by \$2 at every point to MCs as is shown in the Figure 3. At the new intersection between the demand curve and the marginal social cost curve, Q^* is the efficient outcome and P^* is the price. Therefore, by incorporating the social costs of pollution into the analysis, the actual output of the polluting product is reduced to the socially optimal level while the price charged to the consumer rises from P_m to P^* , and the price received by the producer reduces from P_m to P_c . Depending on the elasticities of the demand and supply curves, the burden of the pollution tax is shared by both consumers and producers. The consumers pay ab and the producer pays bc of the ac tax.

Figure-3. Tax effects on consumer and producer



Application of Cooperative Game Theory to Environmental Issues

Global welfare can be raised through cooperation among entire set of interested agents (countries) because environmental issues are global nature. There must be an agreement and all agents are made bound to accept it in spirit and letters otherwise this will create free rider problem for which several agents could gains in terms of monetary or environmental quality without any contribution or paying any cost for availed benefits. As is quite obvious, the possibility to solve environmental problems starts from economic elements. Economic theory generally defines two types of goods.

1. Private goods--- which verify the principle of competition the good consumed by an agent be used by another one.
2. Public goods- --which do not follow this principle. The use by an agent does not limit the use by other agents. There not destruction linked to use (Laffont and Tirole, 1994). For these public goods, a distinction is usually made between those goods for which exclusion is possible (for example, supports, clubs, water resources, etc.) and those for which it is impossible (e.g. national defense, television, parks, etc). Public goods are also non-rival, that is one person's use of the goods does not diminish its availability to another person. So the public goods are characterized by the non-excludability property and as a result there is temptation to enjoy it without contributing to its creation or maintenance.

This situation creates free-rider problem, meaning that nobody wants to pay for the provision of some services or goods. A common poor resource (CPR is a set of private goods (fisheries, trees) for which it is both difficult (but not impossible to exclude from use and for which the cost of defining individual rights is prohibitive. Common pool resources can be distinguished according to level of control on use: the situation is one of open access if it allows entry to anyone interested. Here is again the problem of non-excludability of a common (jointly extracted) resources but unlike public good, a key feature of common dilemmas is the substitutability of benefits (the opposite of being non-rival): the tree I cut, the fish I catch, is not available for others. It becomes clear those environmental goods could either be public goods or common pool resources, with specific problems linked to these types of goods. Facing environmental issues human beings are involved in two different kinds of economic and social problems. As individuals we each better off when we make use of public resources without making any contribution for its provision, maintenance or regardless of effects on its consumption, but aggregate outcome of these individual decisions can be disastrous. Such individual behavior leads to a situation in which everyone is worse off.

As we can see in the literature on environmental economics the market mechanism alone does not resolve the problem of externalities that leads to market failure because the market for environmental goods and services cannot always monetize environmental service or damages and quantify their economic value or attach a price or cost tag to them. The presence of externalities and possible market failure also leads to another problem when individual action of one actor affect the welfare of other one, but there is not any incentive for everyone to address such problem. Game theory can be used to resolve this complicated issue because it is capable to address the economic and social problems of pollution, consumption of resources and sustainable development. Game theory interactions among decision makers (players, persons, firms and nations) affect all stakeholders especially when the action taken by a certain player affect the others; such as the cause of pollution or in general, of environmental externalities. It is fact that human beings have the right and the duty to live on the planet together with environment. It is quite obvious that human beings with their activities do not only affect the environmental variables but also the rest of human beings. Speaks about ‘environmental game’ that is played between a government, human beings and environment. The game shows two different levels of interactions: the first is the “Game of Exhaustion” in which human and nature plays their strategies against each other and the second “society’s Game for environment”, in which different human agents affect each other in terms of environmental damages. Game theory attempts to reach a solution for the conflict generated between these parties, following some kind of fairness; a solution which is socially, economically and environmentally sustainable.

There are several examples in which cooperation used at a local level brings about a better result for human and the environment in sustainable scheme. But there are also several examples of how it is difficult to reach international cooperation to solve trans-boundary environmental problems



when economic interest is in conflict. Cooperation at international level is possible with enforceable agreements but every often there is not an international power that enforce the agreement (Barrett and Graddy, 2000). The critical importance is that the players are able to communicate with one another. This is one of the main causes of non-cooperation at international level and cooperation at local level. Another aspect is the information which is at the core of trust in economics and social affairs because it involves the ability to understand the real intentions of the players in the game. A relevant phenomenon of insufficient information occurs in the presence of asymmetric information between parties. . The cooperative game theory can be applies to the following environmental issues:

1. Fisheries.
2. Acid rain.
3. Forests.
4. Water resources.

CONCLUSION: POLICY IMPLICATIONS

1. The environmental issues are very complicated because it has trade-offs between economic growth and environment. Higher economic growth means higher utilization of resources without considering its far-reaching consequences on the future generations. The resources consumed in the present period will not be available in the next period (in future).So there judicious use is necessary. The difficulty in maintaining balance between economic growth and environmental degradation is not only an uphill task but also a major policy implication for the developing countries like Pakistan, which have been striving hard for sustainable economic growth since long.

2. It is generally observed that strong environmental policies complement and reinforce development. It is mostly poor who suffer from consequences of pollution and environmental degradation. Unlike the rich the poor cannot afford to drink clean water and clean air and pure food because they will have to spend much of their time on the streets, roads, breathing polluted air in the cities. Similarly, in rural areas they are more likely to cook on open fire of woods, haling dangerous fumes, their lands are most likely to suffer from soil erosion. In such an adverse situation, the policies must target poor communities.

3. Private market provides little or no incentive for curbing pollution. Whether it is air pollution in urban areas, the dumping of domestic and industrial wastes in water or overuse of ownerless land, there is compelling case of government intervention. Government interventions are advisable in this case because some environmental policies are likely to be powerfully redistributive.

4. Developed countries which consume over 70 percent of the earth's resources can directly contribute environmental improvement through their own efforts by:

- a. Reducing harmful emission;



- b. Developing clean technology for themselves and for less developed countries (LDCs);
 - c. Changing their own environmentally harmful pattern of demand;
 - d. Stopping the shifting of dirty industries and dangerous chemicals to underdeveloped countries.
5. At regional level the countries must coordinate their efforts through institutional arrangements to prevent earthquakes, oceanic disasters, climatic changes, floods and emissions. They should evolve and implement legal framework to prevent the dumping of wastes or toxics materials as well as dangerous chemicals from developed countries. They must ban the import of such chemicals and electronic waste materials.
6. At national level a suitable legal framework must support the implemental of waste management strategy to ensure standardized system. People must be educated and informed about the proper disposal of wastes and its far-reaching harmful effects. The hospitals wastes must be documented and weighted and it should be disposed of under the supervision of local Environmental Committees.
7. Private sector must be involved in the waste management process and it can help to make the optimal use of scarce resources. An effective Environmental Management System (EMS) is necessary to identify the causes of environmental problems and then eliminating them. The key to effective (EMS) is the use of systematic approach to planning, controlling, measuring and improving an organizations' environmental performance.
8. Well-coordinated efforts at international, regional and national levels are imperative to check depletion of environmental and economic resources, their over-consumption by the rich countries and consequential environmental effects on human beings, plants and animals rather than bearing huge financial costs in their restoration, which is to some extent is impossible.

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