

Impact of Environment on Health; A Panel Data Analysis

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Abstract: This study empirically examined the impact of environment on human health by investigating the relationship of life expectancy with other factors like Gross Domestic Product (GDP), Forests areas and CO₂ emissions. Data of ten highly developed nations has been used to explore this relationship of health and environment. Results have shown that environment and health are closely related to each other. Environmental degradation and deterioration cause disastrous repercussions on health and result in declined life expectancy. The study recommends that implementation of environmental regulations and precautionary measures in manufacturing processes of economies can be very helpful in mitigating the environmental disorders to improve public health.

Keywords: Environment, Forestry, Public Health, Quality of life

JEL Classification: K23, Q23, I18, I31

1. Introduction

Surroundings of a living thing are known as its Environment or habitat. Environment can be comprises of both living and nonliving things. Natural environment comprises of all the natural things on earth including vegetation, air, water, mountains and rocks .We can elaborate it in more simple words as environment is everything that is part of surroundings. It can affect our life by a number of ways, like water, air and all types of plant and animals. On the other hand, health is the physical conditions of a living body. In day to day life we regard health as the physical conditions of a living body having zero level of diseases. A clear and healthy environment is a Pre Requisite for good living conditions. Everyone demands high living standards with good

environmental quality for himself and his coming generations. In modern world it is clear that, to attain these utilities human has enhanced his production processes. These production techniques are carried out through usage of fossil fuels which harmed the environment in form of pollution. Existence of these pollutants in atmosphere has been given birth to many health disorders by causing a variety of diseases.

Environment and health, both are interrelated to each other. In contemporary world debate on the environmental quality and its effects to human health is very common. Environmental changes and increasing levels of globalization resulted in mega emissions of carbon and other pollutants in environment. These pollutants along with lead emissions have taken birth to many ailments of human life, like cancer. These ailments have disturbed and affected the productivity of nations substantially. With decrease in productivity level, these environmental perils also incur ample costs in remedy of these ailments. There is substantial realization about the relationship between environment and its implications on human health. Environment and health are the cause and effect of each other. If cause of anything is good, certainly the effect will be somewhat same. A good and comfortable way of human life is completely dependent upon the excellent levels of its health. World health organization defines health as “A state of complete physical, mental and social wellbeing and not merely the absence of diseases and infirmity” (WHO, 1948). Through this comprehensive definition what is understood is that, health is the name of complete freedom from every type of illness. When we study different types of human illness we come to know that, roughly every sickness has a direct and indirect relation with some type of biological process. These biological phenomena are all dependent upon the environment so, we can extract that environment has a relation with health of human being. To explore and discuss this important relation of health and environment many pure and social scientists have conducted various researches and found that environment and health have direct relationship between each other. In simple words, if the environment will be

clean and pure the health level also will be good and vice versa. Only cause and effect of environment on health is not important, also the degree with which environment effects human health is worth taking, but this calculation has many complexities to handle with e.g. one unit climate change impacts how many units on health? To check the impact of environmental processes on human health this study has been conducted. It includes the environmental assessment of highly developed world. This is a panel data analysis based on the data of different variables from developed countries.

As environment and health are interrelated, working on environmental quality is of primary concern. To make the world realized about the dangers of these environmental disorders many global campaigns are launched by different organizations. Globally, these Agencies are working to protect the environment in particular. These organizations are working on the theme of providing the world with a healthy and safe environment free of diseases. List of these environmental organizations is as follows:

- Earth system governance project (ESGP)
- Global environmental facility (GEF)
- Intergovernmental panel on climate change (IPCC)
- International union for conservation of nature (IUCN)
- United nations environment program (UNEP)
- World nature organization

These forums organize different international conferences and invite the leaders of world nations. These conferences unite international community to hold hand in hand in protecting their habitat. Recently, UNEP has organized a global conference about climate change in France. The main agenda of this gathering was to minimize the carbon emissions in environment. In health sector too, many global platforms are working which are following:

- World health organization (WHO)

- United nations children's emergency fund (UNICEF)
- World Bank
- United nations population fund (UNFPA)

2. Literature Review

Awan (2013) examined relationship between environment and sustainable economic development in theoretical approach. The Environmentalists everywhere throughout the world have stressed the requirement for keeping up ecological quality through practical utilization of assets. All human exercises planned and executed for the financial development of a nation and the social needs would have specifically or in a roundabout way effect on environment. The ecological issues are extremely convoluted in light of the fact that it has trade-offs between financial development and environment. Higher financial development implies higher use of assets without considering its sweeping results on the future eras. Private market provides little or no incentive for controlling pollution. Developed countries which are consuming over 70 percent of the earth's resources can directly contribute environmental improvement through their own efforts by using modern techniques. Developing countries must involve private sector as well as public sector to curb environmental issues.

Renny (2012) discussed the role of health in economic growth and development. Health is a priority intention in addition to a middle driver to monetary improvement and countrywide income increment. Good health has a positive, sizable, and measurably huge impact on total yield. Labor's efficiency is being improved by expanding not only their physical limits, for example, quality and perseverance, additionally expanding their mental capacities, for example, subjective working and thinking capacity.

Everett *et al.*, (2010) worked on economic growth and environment in case of United Kingdom. The UK and the

worldwide economy face critical ecological difficulties, from turning away perilous environmental change to ending biodiversity misfortune and ensuring our biological communities. There has been verbal confrontation about whether it is conceivable to accomplish economic development while likewise handling these difficulties. The natural environment plays an important role in supporting economic activities as providing direct and indirect resources and raw materials etc. Therefore, Natural resources are, vital for securing economic growth and development, not just today but also for upcoming eras. Some accustomed assets accept analytical thresholds, which have to be respected, and there is increasing evidence that we may be abutting or beyond a ambit of the thresholds, not atomic regarding greenhouse gas emissions. Government action is appropriate to ensure that assembly and consumption choices reflect the accurate amount of their ecology impacts. As continued as prices paid by individuals and businesses do not reflect these accurate costs, and whilst incentives to use environmental assets cost-effectively abide weak, accustomed basic will not be allocated or consumed in an acceptable manner.

Heins *et al.*, (2000) worked on Global climate change and health and argued that industrialized nations produce most of the world's greenhouse gas emissions. A change in world climate would have wide-ranging, mostly adverse, consequences for human health. Developing countries, in order to protect their own development prospects, therefore, need substantial incentives to cut emissions, including the transfer of nonpolluting renewable energy and energy-efficient technologies. Reducing fossil fuel disturbance will also have substantial direct health benefits, such as preventing many thousands of air-pollution-induced deaths annually worldwide from both indoor and outdoor sources. Some degree of global warming now seems certain. Therefore, adaptations to climate change will be required, such as housing designs that enhance cooling in summer.

3. Theoretical Framework

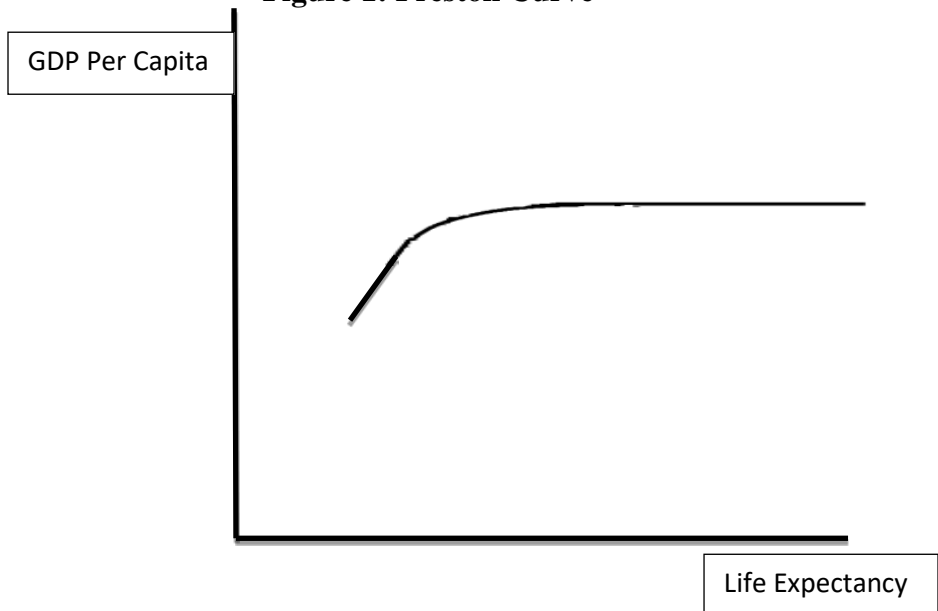
Ecosystem's health and health of human being are interrelated. Both of these are interdependent for long term survival. In contemporary world of competition and industrialization human activities in production of goods and services have affected the health of environment in negative way. To remain competitive; firms and corporations of different countries have produced a mega amount of goods and to avoid the costs of production they don't keep in mind the environmental health. By zero or very low levels of expenditure in protecting environment, these firms impose their costs of pollutant abatement to general public and environment in form of negative externality. These negative externalities have negatively affected the environment in general and human being in particular in form of many epidemics and devastating diseases. Human production methods have given birth to large amounts of carbon emissions, Global warming, depletion of ozone layer and a long list of other pollutants in environment. All of these environmental hazards not only harm human health physically but also in socially and inform of poor working conditions.

There is existence of causality between environment and health. Human activities of production are not the sole responsible for health hazards , many health maintaining activities are also harmful for environment, for example hospitals takes care about health but they use different types of non-renewable natural resources like fuel and electricity which are harmful for environment too.

The main determinant of health is described by life expectancy in the model. Life expectancy is defined as "the average number of years that a person can expect to live in "full health" excluding the years lived in less than full health due to disease and/or injury" (WHO). Main determinant that impacts on life expectancy; and their relation with it is briefly explained.

GDP Per Capita is directly related with the health and in turn to life expectancy. Higher levels of personal or per capita income makes it possible for human being in sustaining good life standards and access to better education, health services, food and other basic necessities which results in adding more years of life. This link of life expectancy and income per capita can be best understood through “Preston Curve” which inhibits that wealthier nations have greater years of life as compare to poor one.

Figure 1: Preston Curve

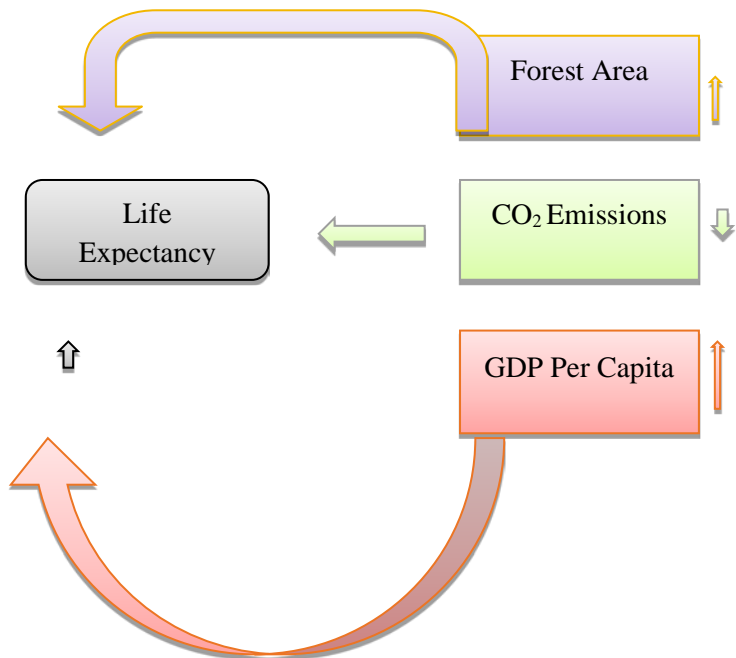


Source: Biciunaite (2014)

Forest area and life expectancy are directly proportional to each other. Forest area provides a vast variety of life sustaining things. Forests not only provide fresh air for respiration but also other life supporting items like fruits and herbs which are used in medical processes and in making medicines. Forests also protect land from soil erosion and enhance land fertility. Air quality, climatic changes and infectious diseases which can affect health directly are directly controlled by forests (Karjalainen *et al.*, 2010).

A normal amount of carbon dioxide is not harmful for environment and human life. When it crossed normal amounts it harms the environment in general and human life in particular. A greater amount of carbon emissions results lungs disorders and other cordial and skin disorders in humans. According to WHO air pollution claims 4.3 million global deaths every year. Air pollution is mainly caused by CO₂ emissions. Through these little facts we can argue that carbon emissions are dangerous for human health.

Figure 2: Flow Chart



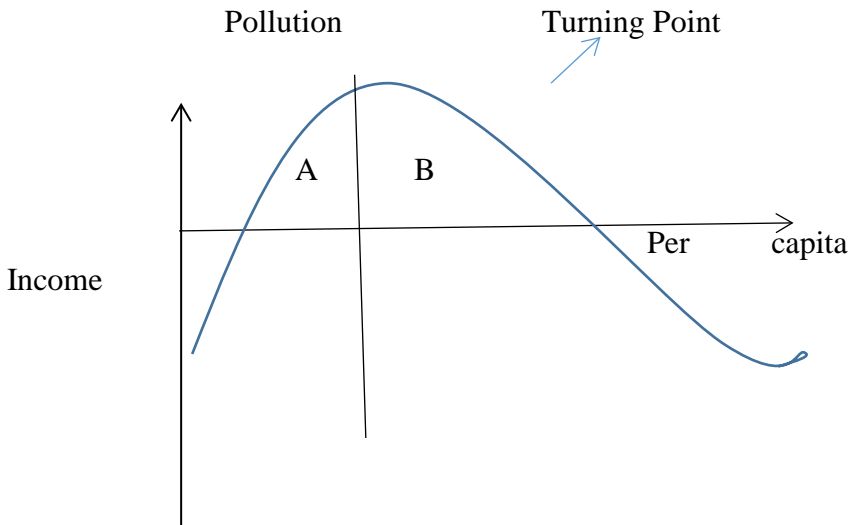
Source: Author's own formulation of framework

Environmental disorders and its protection are closely related to production activities of population. There has been clear relation

between the both. To study this relationship Simon Kuznets proposed an environmental curve which was later became prominent as Kuznets Environmental Curve. What is Kuznets environmental curve and how it explains the relation of environment and economics is given as follows:

While discussing about the relation of income and deterioration of environment, Simon Kuznets provided a solution to American Economic Association (AEA) in 1954. He claimed that initially with the increase of per capita income due to industrialization of economy the level of environmental degradation enhanced. With time as the country achieves prosperity and development this environmental deterioration starts declining. This relation can be explained graphically as follows:

Figure 3: Environment KUZNETS Curve



Source: Aslanidis and Iranzo (2009).

Above figure is the representation of Kuznets curve. In left side of the central line environmental degradation is enhancing with

increase in the per capita income. Peak of diagram is labeled as turning point, as after this point the whole scenario becomes changed and pollution starts showing declining trend. After the turning point per capita income remains increasing but shows inverse relation with pollution. First part which is represented by capital A is the representative of developing nations or start of development. On the other hand capital letter B shows the trend of developed and stable nations.

A producer and firm always try their hard to maximize their profits and to minimize their private costs. They use those raw inputs and production techniques which are less costly for them without concerning about their negative effects on environmental quality. In this way these firms and producers make the use of fossil fuels possible. At the end, production process results in mega amounts of carbon emissions with other chemical wastes which are hazardous to environment and health. These chemical wastes are the social costs which are not paid by producer but faced by society and in economics terms known as negative externality. Negative externalities of production worsen the environmental quality, which in turn harm health of living species.

Initial stages of development, countries show enhancement of pollution and after stability, show declining trend of pollution. This question can be answered by regarding environmental health as the luxury good. In start of development, economies are more conscious about the large amount of goods and services and they don't care about the environmental quality. After achieving prosperity their demand for safe and good environment increase and they regard safe environment as luxury good.

4. Data and Methodology

Model functional form, description of key variables, econometric tools and their analysis has been given in this section.

4.1 Data Sources

Panel data has been used to analyze the impact of environment on health. Secondary data has been extracted from world development indicators (WDI) for the period of 23 years from 1991 to 2015. Ten developed countries of world are included in research in order to analyze the specific impact of environment.

4.2 Model Specification

Following model has been used to investigate the relationship of environment and health:

Life Expectancy = f (Gross domestic product per capita, Forest are, CO₂ emissions)

$$L.E_{it} = \alpha_0 + \alpha_1 CO_2E_{it} + \alpha_2 GDPPC_{it} + \alpha_3 F.A_{it} + \mu_{it} \quad (1)$$

Where,

LE = Life Expectancy measuring the age which a person enjoys on average without any ailments

F.A= Forest Area out of total land area of a particular country.

CO₂E = CO₂ Emissions

GDPPC = Gross Domestic Product Per Capita

μ = Error Term

α_0 = Constant Term

$\alpha_1, \alpha_2, \alpha_3$ = Slope Coefficients of CO₂ Emissions, GDP Per Capita and Forest Area

Subscript “t” is representing time period. Life Expectancy is a dependent variable whereas; CO₂ Emissions, GDP Per Capita and Forest Area are the independent variables. Econometric tools and techniques are being used to check the above model.

4.3 Econometric Techniques

To check the relationship of health with environmental factors panel data has been used which covered ten highly developed countries of world from year 1991 till 2015. Pooled OLS regression has been used to check the unknown effect of independent variable on dependent variable. Regression analysis provides us the effect of independent variables (GDPPC, F.A, and CO₂E) on dependent variable L.E.

To address the problem of Heteroskedasticity, Breusch pagan test of heteroskedasticity is being applied. Another disease which can harm the credibility of data and hypothesis is the problem of multicollinearity. To check whether econometric model has problem of multicollinearity, variance inflation factor has been used.

Ramsey reset test has been applied to check whether in specified model we have omitted variables or not. This test has been applied using STATA.

5. Results and Interpretations

This section entails the outcomes from the regression analysis along with their interpretations.

CO₂ emissions are negatively associated with life expectancy. With more emissions of carbon, health of human being as well as other creatures becomes weak which results in decreased years of healthful life. Results of regression have also shown the same result which describe as; with 1 unit CO₂ emission life expectancy decreased by -8.084965 units.

Gross domestic product per capita is positively associated with life expectancy. With more income one can enjoys the balanced diet and can spend more on health expenditure which adds up his healthy years of life. Results of regression analysis have shown that; with 1 unit change in GDPPC life expectancy changed positively by 4.35e-07 units.

Table 1: Life expectancy is taken as dependent variable

Variable	Co-efficient	t-statistic	Probability
CO ₂ Emissions	-8.084965***	-15.24	0.00
Forest Area	.0277995***	4.90	0.00
GDP Per Capita	4.35e-07 ***	4.52	0.00
R ²	0.6074		
Diagnostics	Breusch-Pagan Test: No Heteroskedasticity VIF < 10 : No Multicollinearity Ramsey Reset Test : No omitted variables (Null hypothesis not rejected at 1% level of significance)		

*** 1% level of significance

Forest areas are the natural forms of vegetation. Forests are beneficial for human health in many ways. On one side forests provide human being with pure and clear climate and air for respiration, and on other end forests provide human with good food and raw material for medical treatment. The same results have been shown by the regression results which tell that with 1 unit increase in forest area life expectancy increased by .0277995. All the results are significant. R² have shown that 61% variation in dependent variable is described by independent variables.

6. Conclusions and Policy Recommendations

Life expectancy is a measure of healthy life without any ailment or sickness. Life expectancy reveals about the average years of life in a geographical region that a person lives on average. Environment is the surroundings of a specific thing from which it extracts many living requirements. To maintain good and healthy life, human beings like everything, needs many items from their environment, so it refers that human beings also depend on natural environment. If the environment would be clean and pure all life sustaining items also be fresh and clean like air, water etc. consumption of clean and fresh environmental things would ultimately results in good health and add more years of healthy life. The main focus of this study was to analyze this relationship of human health and environmental factors empirically.

As GDP per capita is the average income of a specific person in a particular geographical region. GDP per capita displays the actual living standards of inhabitants. If per capita income is higher, citizen would have better excess to higher expenditure in health and food. Better food and health services would provide them with good and more years of life. Results of study reveal that GDP per capita and health have positive relation. On the other hand, we concluded that CO₂ emissions are negatively associated to health as carbon emissions are the reason of many cardiac and other diseases. The third environmental factor that prevailing study analyzes is the Forest Area of a country. The study results show that forest area is an indicator of good and healthy life. In end, we concluded that the environment contains a very important role in maintaining good and healthy life. Environmental pollutant harms the health whereas clean environment helps in improving and sustaining it.

Following recommendations can be worthwhile to maintain a good environment and health;

- Greater care required in coping and minimizing the impacts of industrial negative externalities.

- Industrial and manufacturing units must be installed far from populated areas.
- Governmental environmental policies and their implementation are indispensable.

