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A Cross Country Analysis of the Nexus among Economic Growth, Health Outcome and Environmental Degradation

Mukur Dey[1]

[1]*Mphil Research Student, Department of Economics, The University of Burdwan.*

Abstract

This paper examines the nexus among economic growth, health indicators and some selected environmental variables for South East Asian countries. The society and the environment are inseparable part of any economy. While the very existence of human race and society depends on and within the environmental and economic condition of the country. There has been a spate of recent research which derives econometric relationships between income, health and various indicators of environmental quality. The observation of an environmental Kuznets curve (EKC) for different environmental indicators has led to a variety of conclusions about the overall economic growth and environment relationship. While environment and income are seen to have an inverted-U shaped relationship (Environmental Kuznets Curve (EKC) hypothesis, it has already been recognized that environmental factors can also affect human health positively. Population explosion of 21st century has created huge pressure on environment and various other economic activities of human beings have further increased the exploitation of natural resources. The objective of this study is to identify how environmental degradation varies with economic growth and social condition. For this we construct a simultaneous equation model and a combined environmental degradation index (EDI) from the available secondary data on World Bank website for nine selected South Eastern countries and also check whether health outcomes situation of a country is affected due to environmental degradation (EDI) and economic growth by constructing an index for selected health quality Index (HI). The study tries to focus on possible correlation between a set of socio-economic dimensions and ambient environmental aspects that affect wellbeing of the society and sustainable development of the economy. The results of the empirical analysis emphasis on the fact that there exists two-way relationship between different developmental and environmental aspects in case of the selected developing countries of the South East Asia. Research findings in this regard would be a useful policy instruments towards sustainability of both, the environment and the health sector of the economy.

Keywords: Environmental degradation, Health quality, Economic growth, Simultaneous equation.

Introduction

The association between economic growth, social outcome, and environmental indicators is often complex and requires a detailed inspection for its comprehension. The economic system runs in an interactive way with the environment and the society. Some important economic factors such as gross domestic product per capita, country's total population, trading condition, education level of the population etc. also affect both health and environmental dimensions qualitatively and quantitatively and vice versa.

Population explosion of 21st century has created huge pressure on environment and various other economic activities of human beings have further increased the exploitation of natural resources. The changed environment affected the plants, animals and human beings. Thus, these three entities are intricately inter-linked, and it is therefore important to interpret them in connection with one another. If for any country the economic, social (health, education) or environmental indicators be considered simultaneously then only an integrated view of the functioning and association of an economy can properly be understood.

Economic growth refers to an increase in the amount of goods and services produced per head of the population over a period of time. GDP in general is the universally accepted measure for progress and economic performance of a nation. The achievement of higher economic growth is one of the major objectives of the government policies of the developing countries. It is a great challenge for the developing countries and one important vehicle which can bring these countries out of poverty. But the attainment of higher growth requires that more natural resources be utilized to produce more and more goods and services for mass consumption. As a result there has been an unprecedented rise in the intensity of use of natural resources in the world economy together with an unsurpassed decline in environmental quality.

A population is a summation of all the organisms of the same group or species, which live in the same geographical area, and have the capability of interbreeding (Oxford University press). Population health is an important economic concern for many developing countries. It plays a crucial role in development process, since it constitutes a component of investment in human capital and workforce is the most abundant productive factor in these countries. To produce higher amount of goods and services a country required huge amount of productive factors. For the developing countries healthy population is an asset to the country in this regards. To be healthy people must consume good foods and must get proper health care facilities. Lack of these facilities may affect the population health condition and make them less productive. Less productivity means less income which will hamper the standard of living.

Generally, it is assumed that health outcomes of a country improve when the economy grows. The reason behind is higher level of income permits more access to consumption of good quality of goods and services, better housing and sanitation, education , and medical care services which favorably influence on the health of the population. And it is also true that healthy population constitutes healthy workforces for the economy. Good health is measured by various health indicators like low mortality rates, longevity or life expectancy, availability of proper nutrient, less sickness or morbidity etc. With the improvements in technology and other medical health care facilities, huge changes have taken place in human life.

The word environment is a very broad term; actually it is the totality of the world around us and degradation of environmental quality refers to the overall deterioration of environmental qualities because of adverse change brought by human or natural activities. Environmental degradation changes the basic structure of the component of the environment to such an extent that these adverse changes adversely affect all biological communities in general and human society in particular. The depletion of natural resources, biodiversity loss, soil erosion, emissions of harmful gases etc. which are presently being experienced by the developing countries is partially the result of inefficient land use patterns, cultivation of unsuitable mix of crops combined with misdirected incentives that have contributed to increased production of chemical and organic wastes. In recent times, developing countries face the problems of lack of an adequate supply of clean water, air pollution, explosive growth in population, and the artificial methods of cultivation. Expansion of agriculture and increased agricultural productivity by use of modern scientific technique, chemical fertilizers and pesticides, expansion of educational facilities help solve the problem of growing demand of food for increased population of the world but at the same time it has created various hazardous environmental problems.

It therefore appears imperative to pursue a multidimensional approach to the analysis of national or regional well-being, covering all its aspects simultaneously, within a consistent framework. To have an understanding of the interconnected of these economic, social and environmental aspects that have a bearing on human wellbeing, broad reference can be made to the notion of sustainable development. Understanding the human and natural processes that create environmental, economic or social problems in local ecosystems and the global environment, in the national and local economy, and in communities and individuals is of utmost importance for translating sustainable development from concept to practice. Information is also required on the extent of these problems and on the resulting changes in the ecosystems, economy, communities and individuals, short and long-term, reversible and irreversible. New and better solutions to these problems and opportunities must be sought. Finally, mitigation or elimination of the identified problems and implementation of new solutions is needed. Thus, these three issues should be addressed in the measurement process and they call for using appropriate indicators.

In our study we have taken some of the South East Asian developing countries as they all are lower- middle income developing countries (as per word bank). Bangladesh, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, and Sri-Lanka are the considering countries in our study. Again with environment, culture, tradition, religions, historical backgrounds studied countries are similar in nature. Hence, a detailed investigation of selected economic, social, and environmental indicators of development and their inter linkages is a matter of utmost important for these countries.

The major contributions of this paper are the following:

- To analyses how environmental degradation varies with economic growth, percentage of urban population, education level, and trade openness.
- To analyses whether health outcomes situation of a country is affected due to environmental degradation and economic growth.
- To assess whether education has impact on health outcomes.
- To analyses whether higher health expenditure can ensure good health quality.

Review of literature

The impact of economic growth on population health and effect of environmental degradation has been investigated by many macroeconomic studies during the past 100 years. Scholars examine how and why economic growth affects health theoretically and empirically within and between nations. Various studies have also been conducted to find out the empirical relation between economic growth and the quality or adversity of environmental indices such as emission of GHGs, CO_2 $SO_{2,}$ deforestation, soil erosion, population pressure on land etc. Thus we will discuss them one by one.

Introduction of public health care systems had a significant and immediate effect on health dynamics **Strittmatter and Sunde (2013).** Their findings suggest that health care improvements had a positive effect on growth in income per capita and aggregate. Investigate the causal effect of improvements in health on economic development using a panel of European countries. **Mahal (2005)** observed a strong positive impact of per capita income on health status (life expectancy and infant mortality rate). He also established the reverse causality, with a positive and significant impact of life expectancy on state domestic product. **Mazumdar (2000)** used three single linear equations between GDP per capita (as a standard measure of growth) and life expectancy at birth, infant survival rate, and adult literacy rate, respectively (three variables are proxies for development), and found evidence that in the middle and low-income countries, up to a certain level of income, there is one-way causal relationship between the two phenomena, after which growth and human development moved independently. **Mayer & Sarin (2005)** state that, income may be an important determinant of population health, since it allows them to buy better nutrition or medical care or reduces their stress. If the relationship between an individual income level and its health status is linear, an extra unit of income will have the same effect on health regardless of whether it

goes to the rich or to the poor. **Rodgers (1979)** considers income as a determinant of health outcomes. The study shows that income inequality influences health status not only in developed countries, but also in developing countries, opening the debate about the association between income distribution and health. **Wilkinson (1996)**, according to the study income inequality worsens health because a low ranking in the social hierarchy produces negative emotions such as shame and distrust that lead to worse health.

Boyce (1994) is the first author to examine how economic inequality affects environmental degradation. He supports the hypothesis that greater inequality may increase environmental degradation. **Nondo et al. (2010)** examined the relationship between environmental regulation and economic growth. It was found that initial conditions for environmental regulation negatively influenced regional growth of population, per capita income, and total employment. **Borhan and Elsadig (2010**) aimed to investigate the relationship between economic growth and different indicators of air and water pollution in Malaysia. Air pollution indicators were assessed on the basis of measures like carbon monoxide (CO), sulphur dioxide (SO2), nitrogen dioxide (NO_2), ozone and particulate matter (PM10). Their results supported the Environmental Kuznets Curve (EKC) hypothesis.

Gangadharan and Valenzuela (2001) tried to integrate health outcomes with economic growth and environmental quality in an extended EKC framework for a cross section of countries widely dispersed on the economic development spectrum. While environment and income are observed to have an inverted U-shaped relationship (EKC), it is also well established that development and health are positively related. Their results showed that environmental stress bears significantly negative effect on health status, while gross national product varies positively with health status. **Datta (2007)** estimated a three-equation simultaneous model involving several economic and environmental factors, to focus on the degradation pattern of renewable resources. **Nagar et al. (2008)** analyses interrelationships among economic development, health, and environment in a simultaneous equations framework. It is observed that the environmental stress has had a high cost on income and health and the social infrastructure exerts a more vital role in economic development.

Source of Data and methodology

The present study is based on secondary data set. The model is estimated using data from a sample of Nine developing countries (i =1-9) covering the period 2000 to 2015 (t = 1-16). This period is chosen due to available data for most of the relevant variables for the included countries from the World Development Indicators, 2015 published by World Bank. The required data for the most relevant variables such as GDP per capita, population density, urban population as a percentage of total population, current health expenditure, organic water pollution in terms of BOD emission, ores, and metal exports as a percentage of total exports, GHG emission, fertilizer use, life expectancy, infant mortality rate (per 1000 life birth), maternal mortality rate, gross enrolment ratio, trade openness are obtained from World

Bank's World Bank Development Indicators (WDI) Data-base (http://www.worldbank. org/data). Deforestation data are constructed on the basis of average annual deforestation in the considered countries.

The 9 countries included in our study are developing countries, which rely on their stocks of natural resources and their extraction for purposes of economic development. We have taken countries from South East Asia, including some of the ASEAN countries like Indonesia, Malaysia, Myanmar, Philippines, and India, Pakistan, Bangladesh, Nepal, Sri-Lanka, leaving some South East Asian countries like Afghanistan, Thailand, Vietnam, and Cambodia because of non availability of proper data sets.

Using a Recursive Simultaneous Equation Model (RSEM) we explore the relationship between different economic, social, and environmental aspects of development in the various South East Asian developing countries considered in our study. The endogenous variables in our 1st Recursive SEM are Environmental Degradation Index (EDI) and the exogenous variables are GDP (per capita), square of GDP (per capita), Urbanization (% of Upop), Gross enrollment at School in primary (Edu), Trade as a percentage of GDP proxy for Trade openness of an economy. In the 2nd equation the endogenous variable is Health quality Index (HI) and the exogenous variables are GDP (per capita), square of GDP (per capita) Environmental Degradation Index (EDI), Gross Enrollment at Primary level (Edu) and Current health expenditure per capita (Hexp).

$$EDI = \alpha + \beta 1GDP + \beta 2GDP^2 + \beta 3\ Urbanization + \beta 4\ EDU + \beta 5 Tradeopennes + €it \ldots\ldots\ldots eq1$$

$$HI = \gamma + \lambda 1GDP + \lambda\ 2GDP^2 + \lambda 3EDI\ cal + \lambda 4EDU + \lambda 5\ HEXP + \mu\ it \ldots\ldots\ldots\ldots\ldots\ldots eq2$$

Simultaneous equation models can be divided into two major types: recursive and non recursive. A recursive simultaneous equation model has no reciprocal relationships or feedback loops and no covariance among the error terms of the equations (the disturbance of one equation is uncorrelated with the disturbances of all other equations). A model is called recursive if its structural equations can be ordered in such a way that the first equation includes only predetermined variables in the right hand side. The second equation contains predetermined variables & the first endogenous variable (of the 1st equation) in the right hand side & so on i.e.

Properties of the function:

1. OLS can be applied straight away on the each equation to estimate the parameters.
2. OLS estimates on the parameters of recursive model are best & unbiased.
3. There is no independency among the endogenous variable in recursive model.
4. The same time period disturbances in different equations are uncorrelated. This is the assumption of zero contemporaneous correlation.

In order to ensure better comparability of these data, each indicator has been "normalized" using the **UNDP Goal Post Method** as normalization makes data comparable across indicators, so that the information can be combined in a meaningful way.

Indicator score = (actual value-minimum value)/ (maximum value-minimum value)

$$Xi = \frac{\text{x actual} - \text{x min}}{\text{x max} - \text{x min}} \text{ (For Bad indicator) Or}$$

$$Xi = \frac{\text{x max} - \text{x actual}}{\text{x max} - \text{x min}} \text{ (For good indicator);}$$

Where Xi is the normalized indicator for the year i, X actual is the corresponding pre-normalized value and X max and X min are the maximum and minimum values of the same indicator across all the year. The normalized indicator takes values 1 to 0 (zero).

In this analysis we used OLS (**ordinary least squares)** technique for regression analysis. The OLS estimator is consistent when the regressors are exogenous and optimal in the class of linear unbiased estimators when the errors are homoscedastic and serially uncorrelated. Under these conditions, the method of OLS provides minimum-variance and mean-unbiased estimation. So we will apply OLS for the analysis.

Choice of variables and analytical framework

In this part we discuss the variables taken into consideration for the study. The important implications of those variables and usefulness are discussed. In this part first we take the economic variables and then we move toward the health and environment variables respectively. Two important variables Health quality Index (HI) and Environmental degradation Index (EDI) are not in the list of considered variables, as they need to be calculated, we will discuss them afterwards and calculation related to those variables also shown there. We have taken nine developing countries from South East Asia and their various aspects regarding economic, health, education, and total population, environmental and business conditions to pursue with the analysis. There may be some overlapping variables which can be categorized under one or more categories. Economic Variables An economic variable is any measurement that helps to determine how an economy functions, examples includes GDP (per capita), urbanization as % of urban population, education, trade openness, govt expenditure, taxation policies etc.

Gross Domestic Product (GDP): Gross Domestic Product can be defined as the sum total of money values of all final goods and services produced by the country men within the geographical location of that country in a year. It is the best measurement of a country's standard of living. It indicates how prosperous a country on an average is felt by its citizens. GDP, PPP (constant 2011 international $) is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's

prices is ‘‘the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making any deductions for depletion and degradation of natural resources.’’ Define by World Bank.

Urbanization: The process of Urbanization brings changes to the standard of living to the population. Economic progress of a nation is closely associated with both industrialization and urbanization. Growing share of urban population to total population of a country is called urbanization. With the growth of medium and large scale industries several industrial towns and cities have emerged in developing countries. The progress of a country is often judged by its urban population (% of total).

Urbanization = (No of Urban population ÷ No of Total Population) X 100

Gross Enrollment at Primary level: Education is the process of facilitating learning and the acquisition of skills, values knowledge, and beliefs. In most countries, education is compulsory up to certain age at least primary level. It is assumed that education makes people more knowledgeable and provides better opportunities for living. In our study we have taken Gross enrollment at primary as the variable for education. Primary education provides children with basic reading, writing, and mathematics skills along with an elementary understanding of such subjects as history, geography, natural science, social science, art, and music. It enables them to know the surrounding environment in a better way.

Trade Openness: The openness in international trading situation for a country is measured by dividing the aggregate value of import and export of a country over a period of time by the gross domestic product for the same period. It is assumed that trade openness significantly and positively contributes to economic growth of a country. Trade openness is calculated as the sum total of value of exports (X) and imports (M) of goods and services measured as a share of gross domestic product (GDP).

Trade Openness = {Values of (X+M) ÷ GDP} X 100

Current health expenditure per capita: It is the amount spent by the government of any country for the purpose of providing healthcare goods and services to its population per year. It is generally measured as a percentage of GDP or per capita basis. It shows the country’s awareness or initiatives towards better health for all. We take expenditures on health as a percentage of GDP as an estimate of current health expenditures; it includes healthcare goods and services consumed during each year in the selected countries. Though data are collected from World Bank web site, data of current health expenditure as percentage of GDP are originally collected by World Health Organization Global Health Expenditure database (http://apps.who.int/nha/database).

Health Variables Population health has been defined as "the health outcomes of a group of individuals, including the distribution of such outcomes within the group". It is an approach to health that aims to improve the health of an entire human population (Wikipedia). It plays a crucial role in development process, since it constitutes a component of investment in human capital and workforce is the most abundant productive factor in these developing countries. We have taken various aspect of health such as Infant Mortality (IMR), Maternal Mortality (MMR) and Life Expectancy (LE) of the selected countries to do the analysis.

Infant Mortality Rate (IMR): Infant mortality is the death of young children under the age of one (1). This death toll is measured by the infant mortality rate (IMR), which is the number of deaths of children under one year of age per 1000 live births. Environmental and social barriers prevent access to basic medical resources and thus contribute to an increasing infant mortality rate; Causes of infant mortality that are related to medical conditions include low birth weight, malnutrition, congenital malformations, and infectious diseases etc. Infant mortality Rate is calculated by the formula as below:

IMR = (No of Resident Infant Deaths ÷ No of Resident Live Births) X 1000

Maternal Mortality Rate (MMR): Maternal Mortality Rate is the number of resident maternal deaths within 42 days of pregnancy termination due to complications of pregnancy, childbirth, and the puerperium (the period of about six weeks after childbirth during which the mother's reproductive organs return to their original non-pregnant condition) in a specified geographic area (country, state, county, etc.) divided by total resident live births for the same geographic area for a specified time period, usually a calendar year, multiplied by 100,000**.**

MMR = (No of Resident Maternal Deaths ÷ No of Resident Live Births) X 100,000

The increasing levels of Infant Mortality (IMR) and Maternal Mortality (MMR) lower the standards of living of the society.

Life Expectancy (LE): Life Expectancy (LE) of the country is a measure to found out the longevity i.e. the average time an human being of that country is expected to live, based on the year of its birth, its current age and other demographic factors including gender, caste etc. The most commonly used measure of life expectancy is at birth (LEB), which can be defined in two ways. Cohort LEB is the mean length of life of an actual birth cohort (all individuals born a given year) and can be computed only for cohorts born many decades ago, so that all their members have died. Period LEB is the mean length of life of a hypothetical cohort assumed to be exposed, from birth through death, to the mortality rates observed at a given year. Life expectancy at birth, total (years) is taken as a health quality variable in the analysis.

Life expectancy at birth = No of Total Years a Person Live.

We need to construct **Health Index** related to health quality of the studying countries. Health quality index is nothing but a simple arithmetic average of three indices like infant survivability index, maternal survivability index and life expectancy index.

Initially we have collected the data related to infant mortality rate (IMR), maternal mortality rate (MMR) and life expectancy (LE) then adopting the normalized formulas we construct the infant survivability index, maternal survivability index and life expectancy index.

Infant survivability index (ISI) = (A1-min IMR) / (max IMR-min IMR)

Where A1 = Mortality rate, infant (per 1,000 live births)

Maternal survivability index (MSI) = (A2-min MMR) / (max MMR-min MMR)

Where A2 = Maternal mortality ratio (modeled estimate, per 100,000 live births)

LE index = (Max LE-A3) / (max LE-min LE)

Where A3= Life expectancy at birth, total (years)

Then, combining these three indices we construct the Health quality index (HI).

Health Index=1/3 (ISI+MSI+LE)

All these factors are assumed to contribute positively in health quality.

Environmental degradation is really a bigger and comprehensive problem which includes lowering of environmental quality caused by both natural and manmade factors at the national and global level. In this part we would like to discuss about the environmental pollutants which degraded the environmental quality of the specified countries.

Air pollution: It means the presence of chemical compounds in the air which are usually not present and which lower the quality of it or cause detrimental changes to the quality of life (such as the damaging of the ozone layer or causing global warming). A total of greenhouse gas emission (kt of CO2 equivalent) is taken as a pollutant of air quality in the study.

Deforestation: Deforestation, clearance, or clearing is the removal of a forest or stand of trees where the land is thereafter converted to a non-forest use. Examples of deforestation include conversion of forestland to farms, ranches, or urban use. Deforest area (% of land area) is taken as a variable for constructing the environmental degradation index in this study.

Water stress: The water available in the nature from different sources is never pure and even not absolutely fit for agricultural, domestic and industrial uses. An organic water pollutant (BOD) emission (kg per day per worker) is taken as a variable for water quality degradation.

Soil pollution: It is a part of land degradation and caused by the presence of toxic chemicals substances in the soil. It is typically caused by industrial activity, agricultural chemicals, or improper disposal of wastes. The harmful chemicals in the fertilizers seep into soil and there by pollute the soil. Fertilizer consumption (kilograms per hectare of arable land) is taken as a measure of Soil pollutant or soil degradation index in this study.

Non availability of natural resources: The economic progress of a country is often judge by its expansion of large scale industries. An expansion of industrial activities creates greater pressure upon both renewable and non-renewable natural resources of a country. An Ores and metals export (% of merchandise exports) is taken as a degradation variable in this analysis. Ores and metals exports can be seen as no availability of natural resources for the future generation of the country.

In this part we construct two indices Environmental Degradation Index (EDI) **Environmental Degradation Index (EDI)** is a combined index. The index is a simple arithmetic mean of the air pollution, water stress, soil pollution, deforestation, ores and metal extraction indices.

Environmental Degradation Index (EDI) = 1/5(Air pollution Index + Deforestation Index + Water stress Index + Soil pollution Index + Non availability of natural resources)

Environmental Degradation Index (EDI) is explained by soil pollution index (fertilizer, herbicides, and insecticides used (metric ton) per sq kilometre of arable land), loss of renewable resources (ores, and metal exports as % of total exports), air pollution index as GHG including CO2 emission (kt of CO2 equivalent), deforestation (in % form) and Organic water pollutant (BOD) emissions (kg per day per worker). All these factors are assumed to contribute positively in environmental degradation.

Firstly, all data related to air pollution, water stress, soil pollution, deforestation, ores and metal extraction of those nine countries for the time period of 2000 to 2015 are normalized by the formulas:

Air pollution Index = (z1-min GHG emission)/ (max GHG emission-min GHG emission)

Where z1 = Total greenhouse gas emissions (kt of CO2 equivalent)

Deforestation index= (z2-min deforestation rates)/ (max deforestation rates-min deforestation rates)

Where z2 = % of deforestation.

Water stress index = (z3-min organic water pollutant emissions)/ (max organic water pollutant emissions-min organic water pollutant emissions)

Where z 3 = kg of organic water pollutant emissions per day.

Soil pollution index= (z4-min levels of fertilizers consumption)/ (max levels of fertilizers consumption- min levels of fertilizers consumption)

Where z4 = fertilizers, consumption (kilograms per hectare of arable land)

Ores and metal Extraction index = (z5-min ores and metal extraction)/ (max ores and metal extraction-min ores and metal extraction)

Where z5 = ores and metal exports as a % of merchandise export.

Then, they summed up together and we calculate the mean value for each country for each and every year.

The Model

Using a Recursive Simultaneous Equation Model (RSEM) we explore the relationship between different economic, social, and environmental aspects of development in the various South East Asian developing countries considered in our study. The endogenous variables in our 1st Recursive SEM are Environmental Degradation Index (EDI) and the exogenous variables are GDP (PPP constant 2011 international $), square of GDP, Urbanization (percentage of Urban Population), Education (Gross enrollment at School in primary level), Trade openness (as a percentage of GDP). In the 2nd equation the endogenous variable is Health quality Index (HI) and the exogenous variables are GDP, Square of GDP, Environmental Degradation Index calculated (EDI cal), Education (gross enrollment at School in primary level) and Current health expenditure (as a percentage of GDP, HEXP).

EDI= α+β1GDP+β2GDP²+ β3 Urbanization + β4 EDU +β5Tradeopennes+€it…….....eq1

HI= γ+ λ1GDP+λ 2GDP² + λ3EDI cal + λ4EDU +λ5 HEXP + μ it ……..…eq2

This model is called recursive as its structural equations can be ordered in such a way that the first equation includes only predetermined variables in the right hand side. The second equation contains predetermined variables & the first endogenous variable (of the 1st equation) in the right hand side EDI. $€_{it}$ and μ_{it} are random disturbance terms, assumed to have zero mean, to be homoscedastic and mutually uncorrelated at time t.

Results of the Estimation

From various empirical results highlight the fact that Environmental Degradation is positively related with the GDP and negatively related with the quadratic form of GDP.

Table 1.Results of estimation of 1st structural equation

Variables	Coefficients	t Stat	P-value
Intercept	-0.2326	-2.7736	0.00631
GDP	1.4E-13	7.1885	3.8E-11
GDP^2	-2E-26	-5.3066	4.3E-07
Urbanisation	0.00169	1.90376	0.05902
EDU	0.00392	5.40554	2.8E-07
Trade Openness	0.00054	2.02559	0.04473
R Square	0.54782	F	33.4375
Adjusted R Square	0.53144	Significance F	3E-22

Dependent variable: Environmental Degradation Index (EDI) Calculation based on Secondary Data

It is observed that the sign of the coefficient for GDP is positive (significant) that of GDP^2 is negative and significant. The entire results are consistent with the environmental Kuznets curve context. In fact Environmental Degradation Index (EDI) increases by 1.4E- 13 unit with every 1unit increase in GDP. The economic explanation for this is that, increased economic activity requires use of more and more natural resources leading to depletion and degradation of environmental resources, higher emission of pollutants and more waste as a byproduct. Thus it is often seen that rising per capita income is associated with rising degradation of natural resources. This is due to the reason that with the increase in income, people's demand for commodities also rises relatively leading to greater rate of exploitation of the available environmental resources.

Urbanization also plays a crucial and significant role in the process of environmental degradation. In fact Environmental Degradation Index (EDI) increases by 0.001692 unit if there is a one unit increased in the % of urban population taken as a proxy for Urbanization.

It may be so that urban people use more plastic made goods, automobiles, wooden products, intensive irrigation so the environment get polluted. Urban people are mostly travel by motor vehicles which caused higher GHGs emission and more urbanisation means more municipal wastages leads to air, water, and soil pollution.

From the **table 1** it can be observed that education level (the coefficient is 0.003922 and significant) also increased the environment degradation, the probable caused behind that may be being educated most of the rural people move to the urban areas for significant livelihood opportunities which caused urbanization and also increased the urban waste. As they are mostly poor so they use kerosene stoves, fire woods for cooking and live in the slum areas create wastes and use of motor vehicles also increased air pollutions.

Again trade openness also impact on the environmental quality positive and significantly. Trade paved the way toward globalization. The reason behind this is developing countries are acting as suppliers to the raw materials to the developed countries and importing various hazardous goods which hampered environment of the economy.

Table 2.Results of estimation of 2nd structural equation

Variables	Coefficients	t Stat	P-value
Intercept	-0.38605	-2.31088	0.022322
GDP	7.14E-13	10.1151	2.45E-18
GDP^2	-8.4E-26	-8.59294	1.63E-14
EDI cal	-4.33448	-11.4887	7.45E-22
EDU	0.021723	10.0055	4.67E-18
HEXP	0.079394	3.626594	0.000403
R Square	0.546847	F	33.30662
Adjusted R Square	0.530429	Significance F	3.48E-22

Dependent variable: Health Quality Index (HQI) Calculation based on Secondary Data

From the above result we can say that Health Quality Index is positively and significantly related to the economical growth of the economy. We can be able to see the EKC features between the health quality and GDP. Health Quality Index is negatively related to the quadratic form of GDP which is also significant. This may be so that as GDP of a country improves people get enough money to spend on the health care and get proper food. From the above estimations**,** we can conclude that a high level Gross Domestic Product is a fundamental clause to obtain better health quality in developing countries. Higher GDP enables the people to have a longer life expectancy and lower mortality.

The result shows that Health quality degrades as the environmental degradation increased. From the above estimations, we can say that Environmental degradation has an expected negative but significant impact on health quality. Environmental pollution is reaching worrying proportions worldwide and global environmental pollution, including greenhouse gas emissions, as well as water pollution and soil pollution is considered as international public health problems. Environmental pollutants have various adverse health effects from early life some of the most important harmful effects are perinatal disorders, infant mortality, respiratory disorders etc.

Results shows that education has an expectedly very strong positive influence on the health quality it may be so that by getting primary education people of the developing countries try to take an initiative towards primary health care. For this the life expectancy (at birth) increased, mortality (infant and maternal) decreased. Primary education enable generate the urge for health care among the people.

The current health expenditure also affects the health condition of the developing countries; here the coefficient is positive and significant. For developing economies the need for current health expenditure per capita is huge, but the amount spent on this purpose is not sufficient.

All countries must improve the health outcome conditions. Again mortality or life expectancy not only depends on current health expenditure rather they depend on other health care and intuitional facilities. We can say higher health expenditure can ensure good health quality.

From the above tables we can able to say that environmental degradation adversely affect the health quality of the South East Asian developing countries and Gross Domestic Product has a significant impact on health and environment of these economies. The level of trade openness and education are also important factors for both the sectors.

Policy Prescriptions

Despite being aware of the consequences, activities of the masses hampered the environmental quality including loss of bio diversity, soil erosion, ground water pollution, and noise and air pollution. Thus Governments of these developing countries have to take stronger steps towards strengthening the environmental regulations and protection. Governments must give incentives to the innovative firm which promotes environmental marketing. Governments must give a look into the conservation and management of ground water, soil, forests, and wild life. People must aware of the improper planning and management of irrigation system, use of chemical fertilizers and pesticides. The environment works as a sink for absorbing the waste materials generated out of our production and consumption activities, it is known as the assimilative capacity of the environment. Thus we must try not to exceed this capacity for achieving the sustainable environment. People must give greater emphasis on non conventional energy sources and use of clean fuels. Governments must give stress on the use of recycled plastic materials and waste materials.

Concluding remarks

The results of the foregoing empirical analysis emphasis on the fact, that there exists a bi-directional relationship between different environmental and developmental aspects in the developing countries that are most dependent on the exploitation of environmental resources. The relation between environmental aspects and economic and social well- being of people is the area where considerable interest has been taken by different researchers and policy makers. Ambient environmental qualities affect human physical and mental condition. Health stability required to achieve better education and productivity. The rapid economic growth experienced by the developing countries of the world is creating certain pressure upon the environmental carrying capacity. Though the real problem before them is pursuing the economic growth required to poverty reduction and environmental sustainability for current generation, without hampering the carrying capacity of the environment and the need of the future generations. Therefore for the developing countries with a limited carrying capacity and large population must adopt conventional policies directed towards improving environmental performance of pollution control, focusing on improving ecological efficiency of production and consumption patterns thereby creating a positive win -win synergy between environment, economy and health condition of these countries.

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