"RELATIONSHIP OF ECONOMIC GROWTH AND ENVIRONMENTAL PERFORMANCE INDEX: A STUDY OF SELECT DEVELOPING COUNTRIES"

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Abstract:

Sustainable development refers to a form of development in which the use of resources meets human needs while preserving the environment so that these needs can be met not only in the present, but also for generations to come. It is beholden to apt use of water, soil, natural resources and the accessible competence of human force. The purpose of present paper is to assess and evaluate the association between Environmental Performance Index (EPI) and economic growth in selected developing countries. The other studies on this issue have emphasized on economic growth in environment's devastation. But the impact of enhancements in surroundings excellence is pointed in our study , which is the main peculiarity of this paper in comparison with other studies. To achieve the objective do so we have used a sample of 20 developing countries for which the necessary data were available in 2012. Our findings based on cross-section Weighted Least Squares (WLS) econometrics method designate that the impact of Environmental Performance Index on economic growth in the countries under consideration is positive and is found to be significant.

Keywords: Environmental Performance Index (EPI); Economic Growth; Developing countries, Weighted Least Squares (WLS).

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SECTION 1 :

INTRODUCTION: After the landmark Rio Earth Summit, governments still thrash about to demonstrate improved environmental performance through quantitative metrics of pollution control and natural resource management challenges.The developing countries of the world enjoy wide variety of cultural and economic diversity when environmental issues are dealt with. The environmental concerns of various developing countries like Euro Mediterranean countries, Arab countries in the MENA region are altogether different owing to geographic proximity, Tran's boundary pollution issues and trade relationships of these countries. It is a big challenge to define and measure environmental performance as the factors which are a part of environmental performance is more subjective and on the other side the criteria which is used to measure environmental performance can never be clearly defined. The dimensions of environmental performance are extensive and can be alternatively defied at Environmental performance dimension is wide and could be defined alternatively from macro to micro level i.e from international level, national level, regional, local, and community, household and also at individual level, taking various parameters. Given the various possible dimensions in measuring environmental performance, conducting a comparative study of environmental performance across countries is a very intimidating and exigent task. On the contrary if the uniform measures are there it becomes more comparable. In the preset context and global pressure to reduce the carbon footprints Governments face increasing pressure to show tangible results from their environmental investments. The biggest problem the developing countries face is budgetary constraints. There is an urgent need to design environmental performance indicators that can be used for policy analysis and comparative analysis across countries. There have been parallel efforts to develop such comparative measures. The Environmental Sustainability Index, the Ecological Footprint, the Carbon Footprint, the Water Footprint, and the Environmental Performance Index are examples of attempts to measure environmental bio-capacity and performance. These indices can be used to compare across countries, at a point in time, as there have been attempts to unify the methodology used in constructing them. Between 1999 and 2005, to meet the growing need for accurate environmental performance measurement, Environmental Sustainability Index (ESI) was used, prior to the Environmental Performance Index (EPI).The ESI was developed to evaluate environmental sustainability relative to the paths of other countries. EPI uses result oriented indicators because of shift in focus of the developing

team of the ESI. The Environmental Performance Index (EPI) is a joint research project of two prominent US American Universities (Yale Centre for Environmental Law & Policy, New Haven & Centre for Intercontinental Earth Science Information Network (CIESIN)/, New York) and commissioned by the Global Economic Forum/ Davos , with the objective to establish environment index, which can be used for measurement of quantitative cross-country comparison. For detailed assessment among countries we compare each country's performance in Air Quality, Climate Change, Water Resources, Environmental Health , Biodiversity ,Natural Resources, and categories. The EPI is supplementing the environmental targets specified in the United Nations_ Millennium Development Goals. It will help in achieving long-term environmental sustainability targets, (Färe, R(2004), International Atomic Energy Agency (IAEA). (2005), Statistical Economic and Social Research and Training Center for Islamic Countries (2007)) This index was published in2002, was developed from the Pilot Environmental Performance Index, and also supplement the environmental targets put in the U N Millennium Development Goals.

The EPI have two main objectives one is Environmental Health and another is Ecosystem Vitality, which are defined within 10 policy categories with the help of 25 EPI indicators. These indicators are calculated with the help of wide range of data sets from international organizations, NGOs, government agencies and academia. This data include official statistics that are calculated and officially reported by governments to international organizations (but they are not independently verified); modeled data and observations from monitoring stations. These indicators provide an estimate of how close national governments are to established environmental policy goals of their countries. Using the 25 indicators EPI scores are calculated at three levels of aggregation. Target values are defined for each indicator. The EPI's proximity-to-target methodology facilitates cross-country comparisons, and gives the answer of how the global community is doing collectively on policy issue. Two fixed qualitative environmental goals of the index are

(1) Decrease of environmental stress on human health; and

(2) Promotion of sustainable natural resources management and ecosystem vitality.

Through these goals we can understand policy priorities of environmental authorities and the environmental dimension of the Millennium Development Goals .It must be stressed that the EPI's real in careful analysis of the underlying data and performance metrics. With results

displayed by issue, policy category, peer group, and country, the EPI facilitates the identification of leaders and laggards, highlights best policy practices, and identifies priorities for action but it mainly tracks performance changes over time with respect to clearly recognized, attainable targets(targets are based on the existing worldwide agreements, scientific evidence on the dangerous impacts of pollution on humans and ecosystems, and cost-effective environmental protection strategies(Skillius, A. and U. Wennberg. (1998), (2002)).The Sustainable economic development is beholden to apt use of water, soil, natural resources and the accessible ability of human force. The purpose of present paper is to approximate and evaluate the relationship between Environmental Performance Index (EPI) and economic growth in selected developing countries. The studies about this issue have emphasized on economic growth in environment's demolition. But the special feature of this paper is to see the impact of upgrading in environment quality which is not pointed in any other study. By this study becomes a distinct study in comparison with other studies on this issue. To achieve the objectives of the study the paper is divided into following sections. Section 1 gives the insights about environmental performance issues, policies; practices etc .Section II gives the detailed framework of EPI (environmental performance index). Section III gives describes about data and methodology, followed by Section IV which gives detailed analysis and interpretations of results including concluding remarks and References are contained in the last section.

SECTION II:

FRAMEWORK OF EPI

EPI is a powerful tool for steering environmental investments, refining policy choices, and accepting what dives policy outcomes. As of January 2012 four EPI reports have been released - the Pilot 2006, 2008, 2010, and 2012 Environmental Performance Index. The Pilot 2006 EPI is a composite index of current national environmental protection results. The EPI quantitative metrics covers 16 indicators or datasets. We use broad-based evaluation of the environmental policy literature, the policy consensus rising from the Millennium Development Goal dialogue, and expert judgment to choose these indicators. Long-term public health or ecosystem sustainability goal identified for each indicator. It covers 133 countries. Indicators were sought to wrap the full spectrum of issues underlying each of the key policy categories identified. The below mentioned indicator selection criteria were applied so that we will get most significant and best available metrics,

• **Relevance.** The indicator evidently tracks the environmental issue of concern in a way that is relevant to the countries under a wide choice of circumstances, including a variety of geographic, climatic, and economic conditions.

• **Performance orientation**. The indicator tracks ambient circumstances or on-the-ground results (Oor is a "best available data" substitute for such outcome measures).

• **Transparency**. The indicator gives a clear baseline dimension, potential to track changes over time, and transparency as to data sources and methods.

• **Data quality.** The data used by the indicator must meet basic quality requirements and symbolize the best measure available.

In 2008 EPI we use a broad-based evaluation of the environmental science literature; in-depth discussion with a group of scientific advisors in each policy category; the verification from the Millennium Ecology Evaluation, the Intergovernmental board on Climate Change, the international Ecological Outlook 4 and other assessments; ecological policy debates adjoining multilateral environmental agreements; and expert judgment to choose 25 indicators, Statistical Economic and Social Research and Training Center for Islamic Countries (2007), United Nations Millennium Project. (2005). In this data matrix an EPI can be calculated for 149 countries across the 25 indicators. The 2008 EPI uses the best ecological data available, but constrained by a lack of both quality and quantity in data sources. Due to a lack of data, restricted country coverage, procedural inconsistencies, or otherwise poor-quality metrics, a number of appropriate issues that are considered to be policy relevant and scientifically essential are not reflected in the EPI. In 2010 EPI is different from the previous index in both formation and content. In 2010 we stopped using sub-categories for EBD, Water, and Air Pollution in Environmental Health or Forestry, Fisheries, and Agriculture in Productive Natural Resources. Instead, each of these is raised to category level. For most of the policy categories we have altered the indicators or the data sources for the indicators, and we have also altered the weighting applied to those indicators. In 2010 EPI index increase country exposure by 14, from 149 to 163.The 2012 EPI change the methodology to make it more helpful for policymakers by focusing on a slightly smaller set of core indicators that meet higher standards, including direct measurement , reliable time series, and institutional commitments to sustain these data streams into the foreseeable future. For the 2012 report, a new "Pilot Trend EPI" was made to rank countries based on the environmental performance changes occurred during the last decade, allowing to set up which countries are

improving and which are declining. And one more innovation in the 2012 EPI is to generate greater awareness of the ecological performance indicators 'practical applications in policy and management contexts, drawing attention to innovation and success in these areas and sustaining efforts to identify and share best practices.

SECTION III:

DATA, METHDOLOGY AND MODEL ESTIMATION

The following section gives the details of data and methodology used in the study.

Model, Data, and Estimation Methodology:

We study the case of 35 countries from developing countries and use data for 2008. Data on Environmental Performance Index (EPI), Real GDP, Investment (Gross fixed capital formation) and labor force are from World Bank, International Monetary Fund, World Fact book and Yale Center for Environmental Law & Policy. The basic model to be estimated on cross-section data for 35 countries from developing countries is a simple Cobb-Douglas production function for 2012.

Model Specification

This model to be calculated on cross-section data for developing countries is a

simple **Cobb-Douglas production function for 2012.**

$$GDP = A_i \, Ki^{\beta 1} Li^{\beta 2} \, Oi^{\beta 3} \, EPIi^{\beta 4} \, 10\square_i \text{---------(1)}$$

The variables for country i:

O is the openness degree of economy

K is gross capital formation

L is labour force

EPI is Environmental Performance Index

GDP is gross domestic production

The model can be shown as

$$LogGDP_i = \alpha_i + \beta_1 Log K_i + \beta 2 LogL_i + \beta_3 Log O_i + \beta_4 Log EPI_{I} + \square_i \text{-----------} (2)$$

SECTION IV:

ANALYSIS AND INTERPRETATIONS OF RESULTS

The aim of this section is to identify the current performances of developing countries on the core environmental issues such as air and water pollution, land protection and greenhouse

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emissions, in light of the data and information taken from the Pilot 2006-2012 Environmental Performance Index (EPI) and to examine the relationship of GDP and EPI.

Gross domestic product: GDP is probably the best known widespread measure of the wealth of nation. It is a straight forward and easy measure to compare across the countries even when they differ dramatically in their economic development.GDP is the total market value of all final goods and services produced within a country's economic territory during a given period. GDP methodology is thoroughly defined and standardized. It is a commonly used indicator of market activity and the change in GDP over time shows economic growth and helps in international comparison and aggregation (Lequiller & Blades 2006).

Relationship of GDP and EPI The relationship between environmental sustainability and economic development is complex each level of income, countries face ecological challenges. A few countries manage their pollution. A few countries manage their pollution control and natural resource management challenges very well but some can't do this. Development status is not important for environmental fortune. At the early stage of financial growth, the knowledge of environmental problems is less and environment friendly technologies are unavailable. Ecological degradation increases with growing income up to a threshold level beyond which environmental quality improves with higher income per capita. Economic growth lead to higher quality in environmental conditions in a country. The Environmental Kuznets Curve is used to describe this relationship. At the early stage of development, developing countries are enforced to exploit their environment and cannot afford to protect the environment from pollution. But after sometime, these developing countries reach a level of income where they are able to afford environmentally friendly production methods and can increase government resources committed to safety of the environment. At this level increasing per capita income is associated with an increase in environmental quality. There is an important connection between GDP per capita and the EPI. At every level of income there is some Variation in EPI scores. Conceptually, they have the strongest relationship; therefore this result is not surprising see
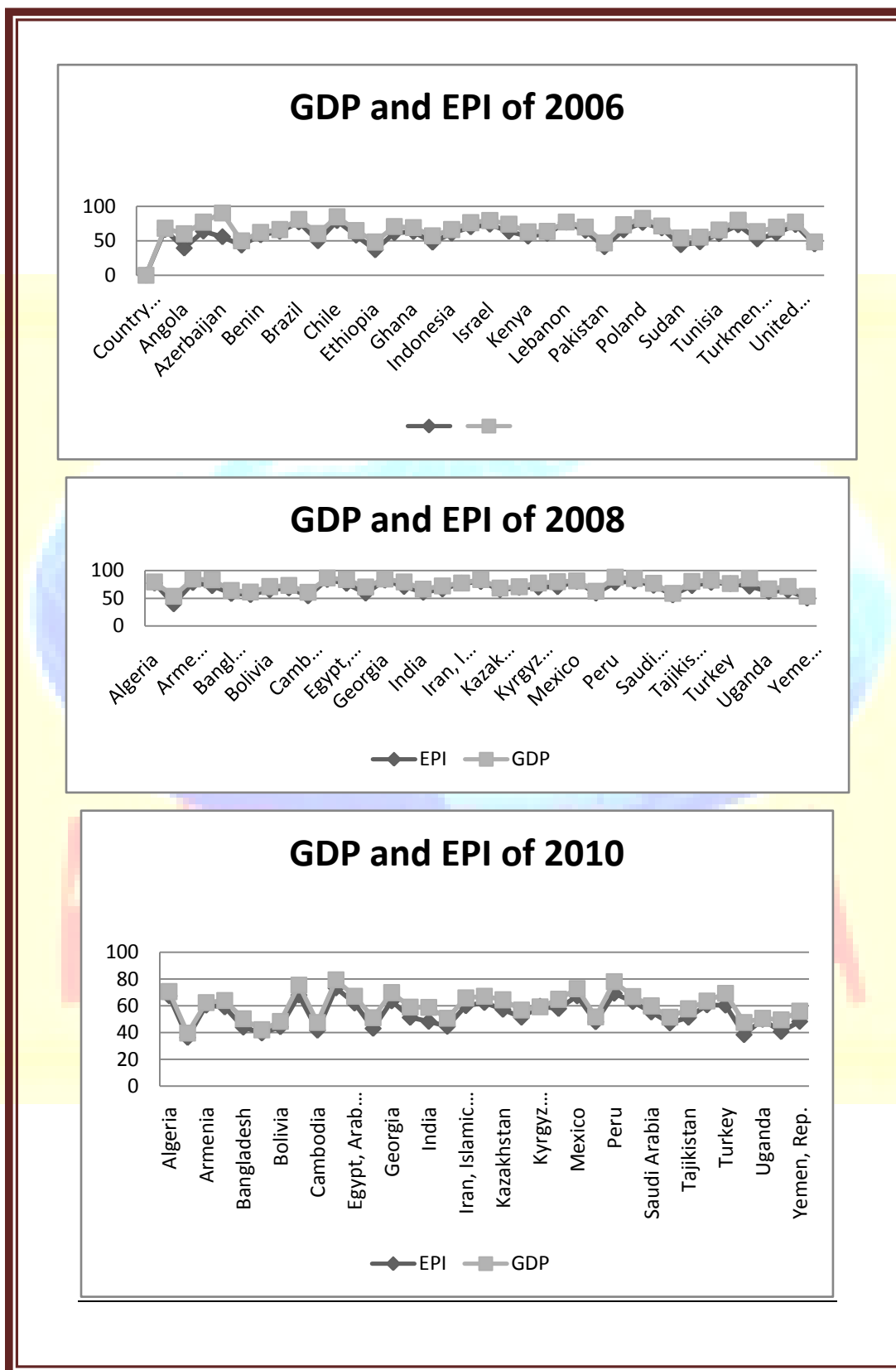
Figure 1 . Relationship of GDP and EPI

Environmental Performance in developing countries

In this section we identify the current performances of developing countries on the environmental issues such as land protection and greenhouse emissions, water & air pollution, in light of the data and information taken from the Pilot2006- 2012 Environmental Performance Index (EPI). The Pilot 2006-2012 EPI sets targets for environmental performances and measures how successful each country is in achieving these goals. Specifically, the report measure overall environmental performance of developing countries and the performance of each developing countries individually. According to data of Yale Center for Environmental Law & Policy 2006, Average score of EPI in developing countries in 2006 was 60.61 of possible 100 shows the performance levels are not very satisfactory. Top 5 performing developing countries in the EPI score in 2006 are Lebanon, Israel, United Arab Emirates, Turkey and Iran, respectively and according to data of Yale Center for Environmental Law & Policy 2008 Average score of EPI in developing countries in 2008 was 69.6 shows the performance is still not very satisfactory but it is better than of 2006. Top 5 performing developing countries in the EPI in 2008 are Georgia, Israel, Armania, Iran and Egypt, respectively. By analysis of the data we can say that a few developing countries that achieved relatively high significant performance in the EPI in 2008.Based on data of Yale Center for Environmental Law & Policy top 5 performing countries in the EPI score in 2012 are Latvia (70.37), Norway (69.92), Luxembourg (69.2), and Costa Rica (69.03).Through these results we can show that it is possible for some middle income countries, such as Latvia (per capita GDP$12,938) and Costa Rica (per capita GDP $10,238) to achieve inspiring environmental outcomes.

This also shows that income alone is not an only reason of environmental performance, good governance and right policy choices also matter. Latvia stands at the top of the new Trend EPI followed by Azerbaijan, Romania, Albania, and Egypt, this means these countries are improving in their environmental performance over the last decade. Whereas many countries had positive environmental performance trends, some deteriorated over the last decade. Estonia, Bosnia and Herzegovina, Saudi Arabia, Kuwait, and Russia were countries with the worst negative trends , see Figure 11

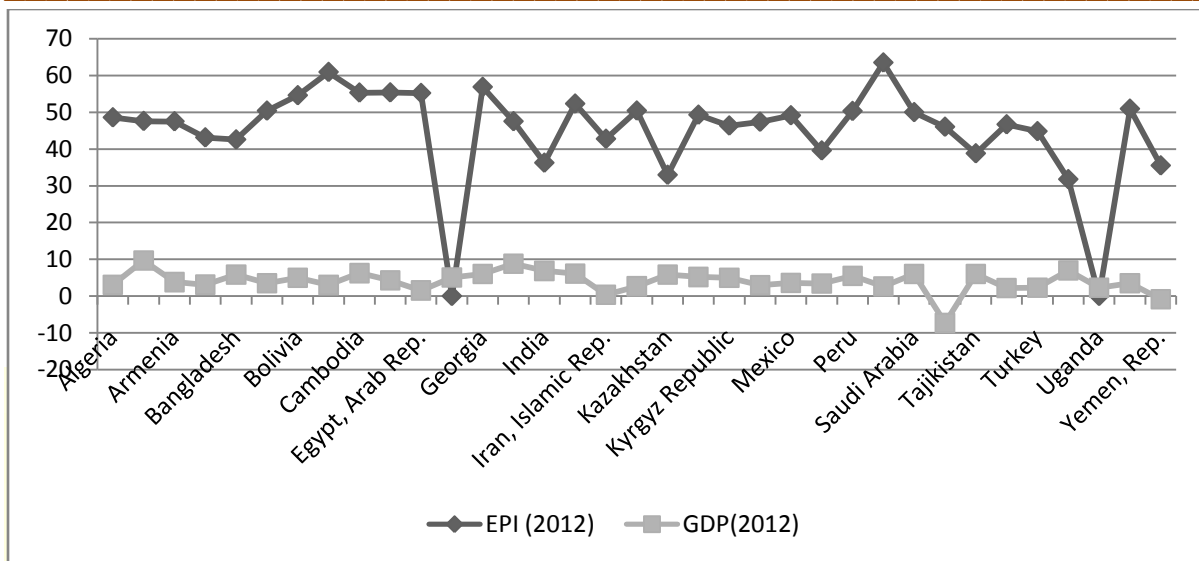**Figure II: RELATIONSHIP OF EPI AND GDP (2012)**

Table 1: WLS regression results

Dependent Variable: LGDP

Method: Least Squares

Weighting series: LOPEN

TABLE 1 WHITE HETEROSCEDASTICITY-CONSISTENT STANDARD ERRORS & COVARIANCE

VARIABLE	COFFICIENT	STD. ERROR	T-STATISTIC	PROB.
LK	O.314241	0.079401	3.320127	0.0002
LL	1.822716	0.311172	5.278337	0.0001
LOPEN	1.386254	0.39128	3.54821	0.0006
LEPI	0.537024	0.183561	5.21119	0.0005
WEIGHTED STATISTICS				
R-squared	0.987354	Mean dependent var		9.9971
Adjusted R-squared	O.986213	S.D.dependent var		9.213517
S.E. of regression	0.411424	Akaike info criterion		1.069936
Sum squared resid	3.103044	Schwarz criterion		1.287865
Log likelihood	-8.177162	Durbin-Watson stat		2.871548

UNWEIGHTED STATISTICS

R-squared	0.525801	Mean dependent var	9.19801

Adjusted R-squared	0.524702	S.D.dependent var	0.89888
S.E. of regression	0.686318	Sum squared resid	9.10414
Durbin-Watson stat	2.677082		

TABLE 2 : COEFFICIENT

	LK	LL	LOPEN	LEPI
LK	0.0007106	-0.00501	0.005998	-0.0152
LL	-0.0051	0.01514	-0.00058	-0.0257
LOPEN	0.006518	-0.00057	0.241613	0.01458
LEPI	-0.01385	-0.02373	0.014782	0.16721

TABLE 3: SUMMARY STATISTICS

	LGDP	LK	LL	LEPI	LOPEN
MEAN	10.011601	9.125324	6.65168	1.78996	-0.17
MEDIAN	10.28046	9.315542	6.7475	1.82881	-0.1688
MAX	11.24411	10.51552	7.601868	1.90364	0.12916
MIN	7.515374	6.544061	6.015123	1.7072	-0.4456
STD. DEV	0.8988	1.254017	0.47462	0.05346	0.17127
OBSERVATIONS	35	35	35	35	35

CONCLUDING REMARK:

Based on regression results in table 1, 2 and 3 all parameters are positive and statistically significant. In other words we can say that with the increase in investment, labor, the openness degree of economy and EPI economic growth will also increase. Based on the results of the paper it seems that the majority of developing countries are required to improve their performances in the Ecological Health, Air Quality, Water Resources, Biodiversity and Habitat and Sustainable Energy categories in order to achieve higher environmental quality, which is the need of today. Thus, developing countries need to enhance efforts in achieving better performance in Environmental burden of disease, pollution impacts of industrialization including greenhouse gas emissions and rising levels of waste, Conservation risk index, Effective preservation, Critical habitat safeguard, Marine Protected Areas (Biodiversity and Habitat indicators), Growing stock change, Irrigation Stress, Agricultural Subsidies, Intensive cropland, Burnt Land Area, Pesticide Regulation (Productive Natural Resources) Emissions per capita, Emissions per electricity generation, Industrial carbon intensity (Climate Change). They also have to solve Environmental challenges come in several forms, varying with wealth and

development, such as access to safe drinking water and basic hygiene, obtain from poverty and under investment in basic environmental amenities and primarily affect developing nations.

APPENDIX 1 (LIST OF SAMPLE DEVELOPING COUNTRIES)

Country name	EPI (2012)	GDP(2012)
Algeria	48.56	3.067
Angola	47.57	9.657
Armenia	47.48	3.809
Azerbaijan	43.11	3.103
Bangladesh	42.55	5.859
Benin	50.38	3.501
Bolivia	54.57	5
Brazil	60.9	3.026
Cambodia	55.29	6.248
Chile	55.34	4.299
Egypt, Arab Rep.	55.18	1.544
Ethiopia	52,71	5.04
Georgia	56.84	6.007
Ghana	47.5	8.793
India	36.23	6.858
Indonesia	52.29	6.1
Iran, Islamic Rep.	42.73	0.362
Israel	50.4	2.666
Kazakhstan	32.94	5.865
Kenya	49.28	5.2
Kyrgyz Republic	46.33	4.988
Lebanon	47.35	3
Mexico	49.11	3.598
Pakistan	39.56	3.4
Peru	50.29	5.506
Poland	63.47	2.636
Saudi Arabia	49.97	6.022
Sudan	46	-7.263
Tajikistan	38.78	6
Tunisia	46.66	2.181
Turkey	44.8	2.294
Turkmenistan	31.75	6.97
Uganda	57,6	2.281
United Arab Emirates	50.91	3.5
Yemen, Rep.	35.49	-0.863

SECTION VI :

REFERENCES

- Skillius, A. and U. Wennberg. (1998). Continuity, Credibility and Comparability _ Key Challenges for Corporate Environmental Performance Measurement and Communication. Lund: The International Institute for Industrial Environmental Economics at Lund University.

- Stakeholder Forum for Our Common Future. (2002). International Environmental Governance: A Briefing

- Statistical Economic and Social Research and Training Center for Islamic Countries (2007), Environmental

- Performance of OIC Member Countries, Ankara, Turkey.

- United Nations Millennium Project. (2005). Environment and Human Well-being: A Practical Strategy.

- Summary Version of the Report of the Task Force on Environmental Sustainability. New York, USA: The Earth Institute at Columbia University.

- World bank, www.worldbank.org

- Yale Center for Environmental Law & Policy (2006) pilot Environmental Performance Index (EPI) report (2006), is available online at www.yale.edu/epi

- Yale Center for Environmental Law & Policy (2008) pilot Environmental Performance Index (EPI) report (2008), is available online at www.yale.edu/epi

- Yale Center for Environmental Law & Policy (2010) pilot Environmental Performance Index (EPI) report (2010), is available online at www.yale.edu/epi

- Yale Center for Environmental Law & Policy (2012) pilot Environmental Performance Index (EPI) report (2012), is available online at www.yale.edu/epi

- http://www.freetheworld.com/2008/EconomicFreedomoftheWorld2008.pdf

- http://www.fraserinstitute.org/uploadedFiles/fraser-ca/Content/research-news/research/publications/economic-freedom-of-the-world-2010

- http://www.freetheworld.com/2006/EFW2006complete.pdf

- http://www.freetheworld.com/2012/EFW2012-complete.pdf

- www.umweltdaten.de/publikationen/fpdf-l/3429.pdfShare

- www.aensiweb.com/aeb/2011/2617-2619.pdf

- International Monetary Fund, www.imf.org

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