Factors of Environmental Sustainability for Africa, Asia, and Latin America

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Abstract

This study incorporates and analyzes several theories in regards to what causes countries to perform in an environmentally sustainable manner. This has been and is becoming an increasingly important and debated topic due to the ever increasing interest and concern about global environmental challenges. This issue has been examined through a variety of different lenses including economic, socio-political, and geographical perspectives and they have an assortment of results. One such existing finding suggests that the best way to improve a country's environmental sustainability is to first focus on improving the gross domestic product which will eventually allow changes to take place through economic force and purchasing power. Using the Environmental Performance Index, which measures how well a country is performing environmentally on an interval level as the dependent variable, my preliminary results suggest to the contrary. The findings show that major factors include education, the effectiveness of the government, and geography.

Introduction

The main objective of this research is to find which factors have allowed some countries to progress faster than others in Africa, Asia, and Latin America with respect to environmental sustainability. It focuses on the countries of these regions as the units of analysis to determine if the solution to the troubles of environmental sustainability is to become more like the traditionally western societies as previous findings seem to suggest despite historically differing cultures.

In order to judge environmental sustainability one must have an understanding of what the term means and implies. Environmental sustainability has been defined as the maintenance of natural capital. This definition breaks the definition down into three different rules: the Output Rule, the Input Rule, and the Operational Principles. The Output Rule states that waste emissions from a region must be kept within the capacity of the local environment without destroying its capability to absorb waste. The Input Rule states that renewable resource harvesting rates must stay within its regenerative rates and that nonrenewable resource consumption rates must be lower than the rates for a renewable replacement. The Operational Principles has three parts. It states that the consumption rates of resources must stay within the environments carrying capacity, technology for sustainability must grow faster than exploitive technology, and renewable resources must be profitable. If a region does not meet these rules, then it does not meet the requirement of "maintenance of natural capital (Goodland, 1995)." The prolonged inability to fulfill these rules has had a detrimental effect on the environment already. We are currently creating waste emissions faster than the environment can absorb it. If emission rates continue the way they are, then within the century the global temperature will rise higher than Earth has reached in the past 40 million years (Clack & York, 2005).

In order to preserve modern culture as we know it for future generations, society must become more dedicated to environmental sustainability. Society needs to acknowledge and accept that it is necessary to alter the collective frame of mind around resources. If it fails to do so then the high price and scarcity of energy may create a completely different sociopolitical culture and, quite possibly, another world war (Cassar, 2009). Throughout history groups have fought with each other for natural goods. There is a

direct relation between environmental scarcity and violence (Homer-Dixon, 1999, pgs. 104-06).

Understanding more about the challenges for environmental sustainability is the first step to being able to develop the most appropriate policies that support safer practices for the target regions as well as for other nations with which they interact. To reach to best decisions about environmentalism, facts and the best possible information are needed (Lomborg, 2001, pg. 5). Since this is such a large and complex issue it is very doubtful that there is just one, of only a few, factors that determine the level of environmental sustainability, but rather many contributors. The point of this study is to find the largest and most encompassing determinants, not a silver bullet or a magical pill that can universally solve the difficulties.

Literature Review

Ever since people began to recognize the damage that was being done to the environment as a result of human consumption, there have been theories that tried to explain it. Most of these theories typically fall within one of three different categories; economic, sociopolitical, or geographical perspectives.

The Determinants of Environmental Sustainability in Africa and Asia written by Kira Stoller is very similar to this study and, in many ways, this study adds to her research. In her paper, Stoller hypothesizes that there are five main independent variables, each of which fit into one of the three perspectives, which affect a country's level of environmental sustainability. The first of these, the country's type of governance, falls into the

sociopolitical group. The amount of aid a country receives from others, the level of international trade, and the level of economic development a country has reached fit into the economic perspective. The final independent variable was the continent in which the country lays, which is geographical. She then tested her hypotheses by using the Environmental Performance Index as her dependent variable. The EPI was created by a joint effort of Yale and Columbia Universities and is renewed every two years. It ranks countries according to many environmental indicators across several policy categories and gives them a score out of 100. She ran a regression analysis and found that only two of her independent variables had significance, the gross domestic product per capita and the geographic location of a country. Stoller's results helped lay out the structure of this study.

Economic Theory

There are many political scientists and researchers that firmly believe that in order to perform better environmentally, a country must first focus on increasing its wealth. In his very controversial book *The Skeptical Environmentalist*, Bjorn Lomborg discusses how the best way to improve the environment is to not worry so much about it. He says that we as a world spend so much money on trying to improve the environment and receive only meager benefits. He argues that the money could be much better spent on other investments such as technology, education, and helping others become more prosperous; all of which will pay off more towards the environment in the end (Lomborg, 2001, pg.324). Lomborg clearly spent a significant amount of time digging up research and finding statistics and graphics, but the conclusions that he drew from them often oversimplified the data and theories he tried to discredit or overstated his point and its implications. His

main positions in the book were that the dangers and magnitude of environmental problems have been blown far out of proportion and that resources that have been spent to clean up the environment should have been reallocated to where they could have actually made a difference.

Another study conducted by Barrett and Graddy examines the role of economics as well as civil and political freedoms in respect to environmental sustainability. In the economic portion, the study compares the levels of pollutant concentrations of several countries to their gross domestic product per capita. The data shown on the multiple regression tables and on the scatter plot showed that the peak pollutant concentration levels appeared in countries with low levels of development and become cleaner the higher the GDPPC became. A problem with the report is that it limited itself to countries that had a GDPPC lower than $18,000. The data seemed to suggest that once a country reached a GDPPC level of around $16,000 the pollutant concentration trends seemed to rise back up.

Sociopolitical Theory

Factors that deal with the interaction between the society and politics are often used when examining the environment in culture. Fraizer explains the progress of environmental sustainability in Chile as the nation shifted from a dictatorship to a democracy. Fraizer explains that the rise of interest groups and environmental activists, which was made possible by the regime shift, has prompted dramatic changes. This source gives an in-depth and specific example of the benefits of a democracy to environmentalism. Examining the same issue on a larger scale Hochstetler looks at several countries that have relatively recently made the transition from an authoritarian regime to a liberal democracy,

mostly from the former Soviet Union and Latin America, and their relationships to environmental protection. In this qualitative paper Hochstetler's results find that, due to pressures from their people, liberal democracies are more likely to participate in supportive international organizations, create and support environmental agencies that are effective at regulation, and allow environmental activists to have more voice in politics. After examining these results, it is concluded that democracies promote conditions that allow environmental sustainability to prosper better than authoritarian governments. The issue with these reports is that they are both qualitative papers and have no data to support their statements that this newfound voice was the cause of the shift in environmentalism. It is more convincing when a report uses tables and graphs and states that the data shows that there is a positive correlation between the amount of civil and political freedoms of a people and the condition of their environment as Barrett and Graddy do (2000, pg. 453)

The Implementation of environmental practices depends on the effectiveness of governance. Steinberg writes that success in environmental politics is essentially the government's capacity for social change. This paper examines the stability and effectiveness of different countries' governments to see how much of a role that plays in their environmental practices. Steinberg reaches the conclusion that countries with higher stability, as a whole, have healthier relationships with their environment. He goes on to say that stochastic governments, ones that are unable to reach a consensus, are more likely to have proposals stalled in the legislature due to fractious politics causing a stalemate government. This also means that existing programs and agencies do not receive the necessary support and resources to be effective. Stable governments are also able to direct

more effort toward environmental issues because they do not have to deal with state-survival issues on a regular basis. Steinberg recommends that struggling countries focus on restructuring the bureaucratic design to make their stochastic societies more efficient and therefore more competent at environmental sustainability.

Goodland argues that education is the most effective indicator. He places such a strong emphasis on this because an educated workforce will be able to make the technological advances necessary for environmentally safe practices. They will be able to innovate solutions for themselves and also be able to operate the technologies on their own. A more educated population will better be able to understand the challenges and causes of environmental sustainability.

Geographical Theory

There are some researchers that strongly believe that one of the largest and most important determinants of a country's level of environmental performance depends on its geography. The proximity to and ability of a country to interact with others is invaluable as it allows for the exchange of goods, services, ideas and technology. Interaction between cultures, whether intentionally or unintentionally, will inevitably lead to diffusion. Diffusion is "the spread of social or cultural properties form one society or environment to another (Kinnunen, 1996)." This spread of ideas can pertain to the attitudes toward environmental sustainability in that the priorities of one country very well may influence others in its proximity through frequent interaction.

Another aspect of geographical theory is that a country can only do as well as the resources that are available to. In *Ending Africa's Poverty Trap,* authors Sachs, McArthur, Schmidt-Traub, Kruk, Bahadur, Faye, and McCord (2004) discus how many Sub-Saharan African countries do not have climates that are conductive to growing crops. Inconsistent rainfall and poor farming practices that remove nutrients from the soil has left these countries unable to feed all of their population much less sell the surplus as an income. Or on the other hand a country may have an extraction resource in abundance which brings in revenue, but wreaks havoc on the environment.

Hypotheses

This study was created to test each of the three theoretical categories with seven specific hypotheses.

Hypotheses 1: There is a positive relationship between country Environmental Protection Index scores and their per capita gross domestic product which will show that environmental performance is dependent on long term economic development.

Hypotheses2: There is a positive relationship between country EPI scores and annual growth in GDP which will show that environmental performance is dependent on short term economic development.

Hypotheses3: There is a positive relationship between country EPI scores and the level of voice and accountability which will show that environmental performance is dependent on how much say a people have in their government.

Hypotheses 4: There is a positive relationship between country EPI scores and the level of governmental effectiveness which will show that environmental performance is dependent on the ability of a country to accomplish goals.

Hypotheses 5: There is a positive relationship between country EPI scores and literacy rates which will show that environmental performance is dependent on the level of education.

Hypotheses 6: There is a positive relationship between country EPI scores and cereal yields (kg. per hectare) which will show that environmental performance is dependent on the productivity of the land.

Hypotheses 7: There will be significant trends between country EPI scores and the region in which they are located which will show that environmental performance is dependent on the geographic of the world in which a country lays.

Methods

Variables

Dependent Variable

This study uses the Environmental Performance Index scores for the dependent variable as a fairly comprehensive measure of environmental performance. The EPI was created by Yale and Columbia Universities in 2006 and have published updated figures every two years according to ever more current data and theories. The EPI publication of 2010 gave its scores and rankings according to 25 indicators which fall into 10 different

policy categories. Some of these indicators include greenhouse gas emissions per capita, water quality index, and environmental burden of disease which fall into policy categories climate change, water in respect to its effects on the ecosystem, and environmental burden of disease respectively. Each of these indicators represents a data set which includes those that are collected by governments and reported to international organizations, research by international organizations and observations from monitoring stations. Once this data is collected, it is entered into an index and each indicator is weighted accordingly. The score that a country receives is out of 100, a higher score denotes better performance. The creators recognize that there are data gaps that they would like to address but there is simply not enough consistent data from each country to include indicators such as exposures to toxic chemicals and heavy metals, nuclear and pesticide safety, and agricultural soil erosion.

Independent Variables

The data collected and used in this study came from international as well as government organizations. The World Bank provided a source for variables GDPPC, GDP growth, and cereal yield as their Human Development Indicators. The GDP growth included figures that were recorded for the year 2009, or if the data for that year was unavailable it was recorded for the 2008 growth levels. Countries that had only collected data for the year 2007 or earlier were not used. This is because such data would be misleading due to the drastic change in global growth trends in 2008.

The World Bank also provided variables voice and accountability and government effectiveness in their World Governance Indicators project. This study uses the interval

measurement of voice and accountability as an alternative where other reports used a nominal indicator of governance, using such labels as “democracy” or “authoritarian”. The reason for this is not only for the purpose of a higher level of measurement which reveals a more accurate relationship, but also because it is often difficult to place many countries governments into these categories. These studies used governance labels in order to describe the change in how much people could influence the government through interest groups and an individual’s ability to participate in their government, which is exactly what the World Bank measures with voice and accountability. A higher voice and accountability score denotes a higher level of freedom for participation in the government. The figures collected in the WGI and the data presented is meta-analysis of governance. Each indicator represents the results of surveys given to public, private and Non Governmental Organization sector experts around the world and conducted by several dozen organizations. The Literacy rates were retrieved from the CIA World Factbook website which collected the data as reported by each respective government.

Testing

The units of analysis are the 122 countries in the targeted regions of nontraditionally western societies, Africa, Asia, and Latin America, that received an EPI score of the year 2010. The number of countries dwindled further as there were eight more countries with insufficient independent variable data. This leaves the remaining 114 countries as the units of analysis. These countries were then analyzed by their GDDPC level, GDP growth, level of voice and accountability, government effectiveness, literacy rates, cereal yield, and their geographic location.

All the values that were collected for each variable was entered into the statistical computer program called SPSS. Non-numerical data was then recoded into numerical data to allow the program to use it. For example, Latin American countries were labeled with a "0," African countries were labeled with a "1," and Asian countries were labeled with a "2." The GDPPC was then recoded to report its figures in the thousands which would allow more data to be revealed once analyzed. All the data collected from the World Bank and the CIA were then entered into a linear regression analysis table. The countries were then split into their respective regions and each variable was run through a regression analysis again for each Africa, Asia, and Latin America.

Table 1: Multivariate Regression Analysis of EPI by Region

Independent Variables	*Africa, Asia, and Latin America*	*Africa*	*Asia*	*Latin America*
GDP Growth %	-.189**	.042	-.250	-.324*
	(.198)	(.374)	(.279)	(.533)
GDPPC (by thousands)	-.235**	.086	-.350*	-.326
	(.108)	(.703)	(.125)	(.620)
Government Effectiveness	.342**	.417**	.392*	.682**
	(1.98)	(3.281)	(2.753)	(4.685)
Literacy Rates	.278**	.203	.044	.340
	(.051)	(.082)	(.085)	(.223)
Voice and Accountability	.038	-.295*	.190	-.429*
	(1.334)	(2.381)	(2.017)	(.223)
Cereal Yield (kg per hectare)	.226**	.369**	-.019	.272
	(.011)	(.001)	(.001)	(.002)
Constant	43.65**	39.15**	59.27*	33.67*
F	13.79	5.76	2.64	4.22
Adjusted R^2	.443	.497	.186	.585
Number of Cases	116	44	47	25

Note: β of regression reported with standard errors in parentheses.

*p< .1, **p< .05

Source: Users analysis.

Findings

Non-Western Regions Results

The results for the combined regions of Africa, Asia, and Latin America contain elements that were both surprising and expected. After analyzing the relationships, the table shows that higher levels of long term economic development, GDPPC, and short term economic development, GDP growth, do not promote safer environmental policies, but rather inhibits them. These variables are also significant as they are within the 95% confidence interval. The negative relationship of the GDPPC is at a moderately strong level and its affect is noteworthy.

In respect to the sociopolitical variables, only one, voice and accountability, was unable to reject the null hypotheses theory as it was outside an acceptable confidence. The other two variables in this category are, however, significant. The table shows that the data supports the hypotheses regarding literacy levels and government effectiveness in that higher levels in both of these variables result in a higher EPI score with considerable strength.

Individual Region Results

For Africa there are only two independent variables with a significance level below .05, these are the levels of government effectiveness and cereal yield. Both of these relationships are relatively strong with β-scores of .417 and .369 respectively. This means that in African countries, the environmental performance relies significantly upon the ability of the government to accomplish tasks and the fertility of the soil. There is another

variable outside the .05 but within the .1 significance level which gives cause for discussion. The voice and accountability variable indicates that there is a chance that countries with less political rights perform better environmentally than those that are more free.

Asian countries in a group of their own do not seem to follow the same trends as when all three regions are combined as none of the variables are within the 95% confidence level. There are, however, two variables that are within the 90% confidence level and as such should be regarded with some skepticism. These variables are the GDPPC and the government effectiveness, both of which suggest a stronger relation than those for regions combined.

The table shows that in Latin American countries, environmental performance depends heavily upon the effectiveness of the government. With a significant β-score of .682, it is the strongest variable on the table by far. There are also two variables that had p-scores between .05 and .1, GDP growth and voice and accountability, both of which suggest a relatively strong negative relationship.

Discussion and Interpretation

The countries seem to be linked together more by the shared exclusion from the traditionally Western countries than they do with being included in their own regions since there a much stronger significance in the more general group than there was with the geographical regions. The governmental effectiveness was what seemed to be the universal factor as it was strongly significant in almost all categories.

Similar results have been discussed regarding the negative relationship of the economic factors to environmental sustainability by theorists in several different fields of study. One such source is a philosopher named James Speth who writes, “Capitalism as we know it today is incapable of sustaining the environment (Speth 2008, pgs. 62-3).” He sites several reasons for this claim. There are now more than 63,000 multinational corporations in the world today and over half of the largest 100 economies in the world are included in that number. These companies use their purchasing power to secure what they need. This coupled with their involvement and influence in modern democratic governments has the potential for interaction with politicians with questionable motives. This can become compounded with the short-sightedness that can be caused by short election terms and the need to focus on short term rather than long term goals. He also argues that the more capital people have, the more they will consume.

Examining the results for Latin America, the results do make sense in a way even though they were unexpected. Latin America has had a long history of authoritarian regimes ruling the countries (Hochstetler, 2007) Most of these countries had been European colonies since their discovery by westerners in the 16th century through the mid 19th century. Even after they gained their independence, many of them had dictatorships take over with strong and efficient governments that repressed the people and did not achieve much economic success which have lasted only until relatively recently.

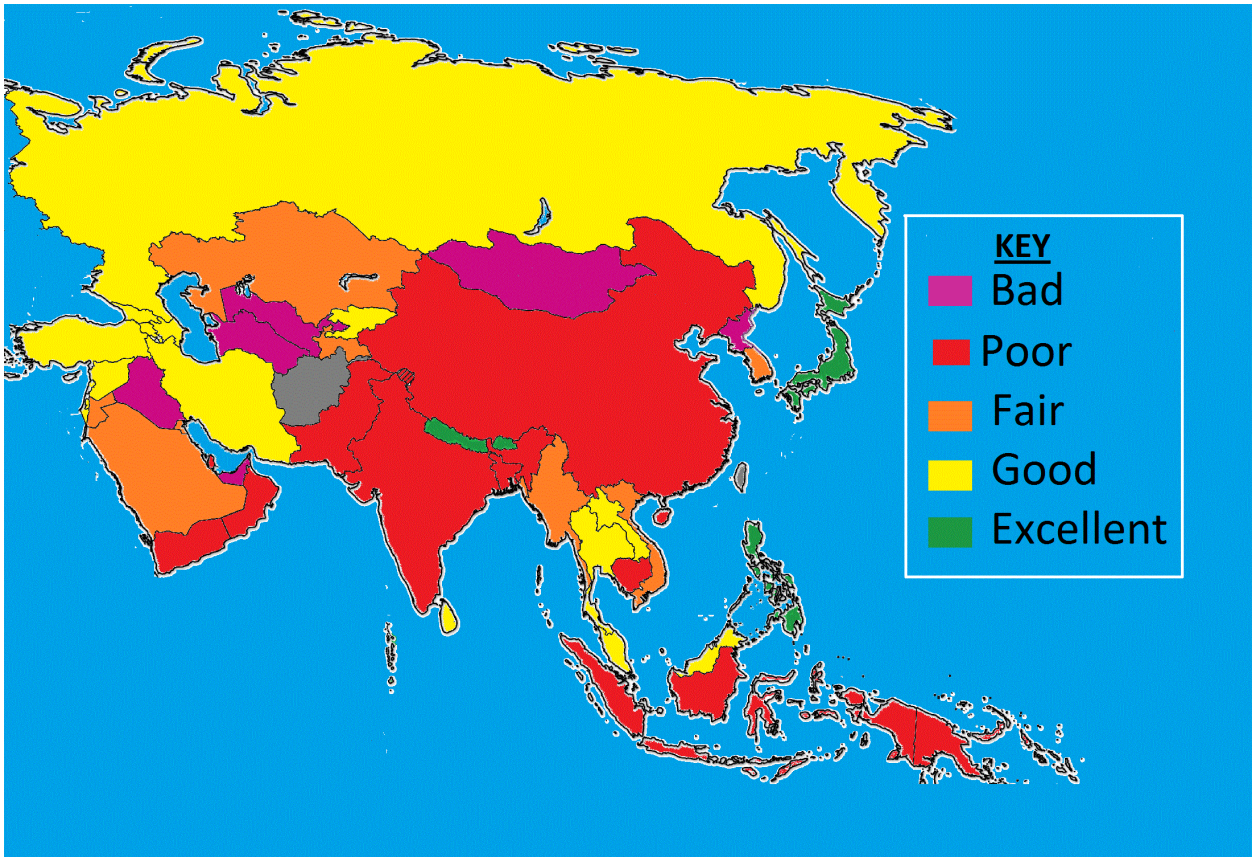
Conclusions

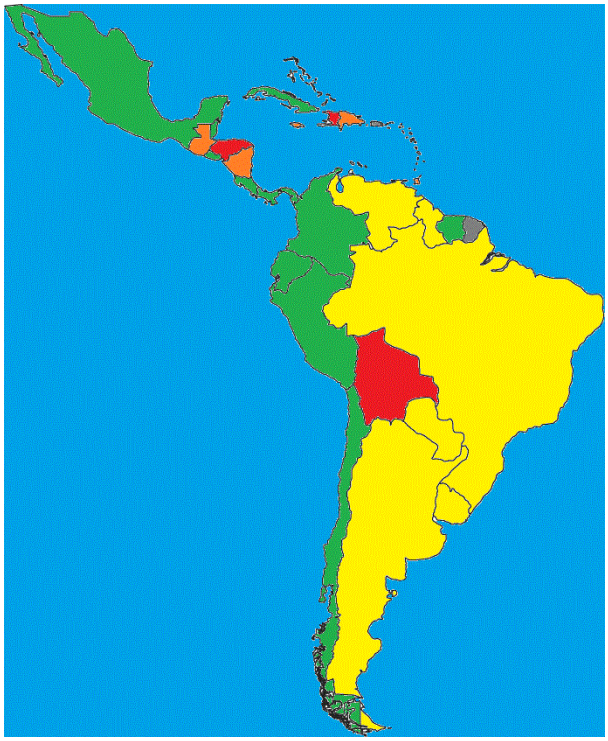
This research shows that there are holes in the economic environmental theorists' arguments, at least when it comes to traditionally non Western countries. Sociopolitical arguments seemed to show the most significant arguments, although it does open the discussion up to how the best way for countries in this region to improve their EPI perhaps is not to become more like western societies after all.

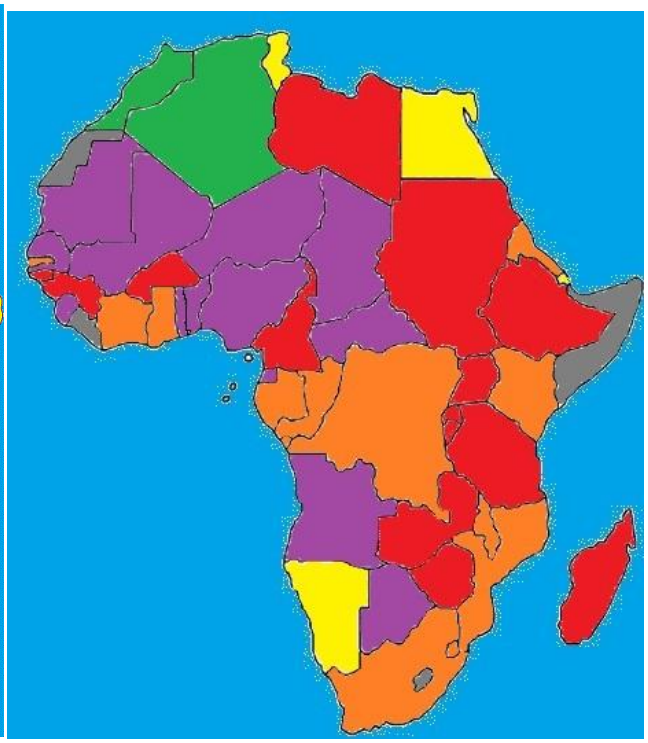
If someone else were to decide to pursue a similar research topic I would suggest to them to use a time-series method to compare countries' EPIs with those of other years, especially in respect to drastically changing factors from year to year such as the GDP growth. Another suggestion would be to search for variables that inhibit environmental sustainability as well as those that promote it.

Appendix

The following images show the EPI score for each country in the regions with available scores. The EPI was split into five different levels of with fairly similar numbers included into each category. EPI scores by category are as follows. Bad= 32-42.8, Poor= 42.9-50.1, Fair-=50.2-59.0, Good=59.1-65.0, Excellent=65.1-86.4







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