

Environmental Sustainability and Economic Development: A World View

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Abstract

Sustainability, especially environmental sustainability, has obtained more and more attention globally. However, many questions remain unclear. For example, how economic development and environmental sustainability are correlated with each other? How economically developed a country needs to be when environmental sustainability becomes necessary? Does environmental sustainability require certain degree of economic development? The purposes of this study are: (1) to investigate the relationship between environmental sustainability and economic development; (2) to examine the current status of environmental sustainability in both developed and developing countries; and (3) to develop a world view of environmental sustainability. By applying well-developed theories (Maslow's Hierarchy of Needs and the Environmental Kuznets Curve) and analyzing reliable statistical data (Environmental Performance Index, Environmental Performance Index, CO₂ emission, energy consumption, ecological footprint, and waste generation), two correlated relationships (positive vs. negative) between environmental sustainability and economic development were identified, followed by the development of two types of environmental sustainability (proactive vs. passive). When both correlated relationship were combined, the Environmental Sustainability Curve was developed and supported by the Environmental Kuznets Curve. Then by following product life cycle, the current status of environmental sustainability in both developed countries and developing countries were examined. At the end, when the world was examined as a whole by combining the developing countries and developed countries together, a world view of environmental sustainability was formed. Even though developed countries have a low environmental impact from production stage and disposal stage and developing countries have a low environmental impact from consumption stage, the world view combined with both types of countries is very troublesome and serious due to high environmental impact from production, consumption and disposal. Therefore, immediate response to address all the environmental damages is necessary from all countries.

Keywords: Environmental, Sustainability, World, Economy

1. Sustainability

1.1 *The Scope of Sustainability*

The concept of sustainability was first introduced in 1972 at Stockholm United Nations conference emphasizing the links among economic development, social development, and environmental protection (Drexhage & Murphy, 2010). Based on this original definition, sustainability has been evolved over the last forty years; today these three dimensions still form the core of sustainability and each dimension focuses on different subsets. Specifically, the environmental dimension focuses on energy, water, greenhouse gases, emission, waste, recycling, and packaging. The social dimension is more related to community investment, working conditions, human rights and fair trade, public policy, diversity, safety, and anticorruption. The economic dimension connects with accountability, corporate governance, stakeholder value, economic performance, and financial performance. In 1994, John Elkington, the founder of a British consultancy called SustainAbility, developed Triple Bottom Line Theory (TBL) (Figure 1), which captures these three dimensions and emphasizes on how sustainability can be achieved eventually (Elkington, 1997). The TBL consists of three Ps: (1) Profit, which is related to economic dimension; (2) People, which is related to social dimension; and (3) Planet, which is related to environmental dimension. Even though originally TBL aimed to measure the financial, social, and environmental performance of a corporation over a period of time, it has been extended to a broader spectrum, such as on a national level, or a smaller scale, such as from an individual consumer perspective.

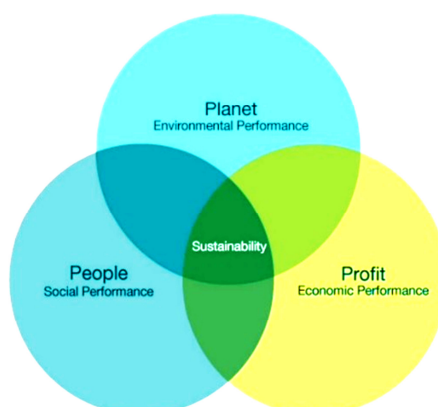


Figure 1. Triple Bottom Line Theory (Elkington, 1997).

Among these three dimensions, economic dimension is often chosen as the most important one by most countries because economic development is the foundation of any nation. Having an economic focus and economic sustainability will not only provide the necessary financial support to its people, but prepare any country for further national development. Therefore, most countries in the world do not question about the importance of economic sustainability. No matter where a country is in term of its developmental level, a developing country or a developed country, the economic sustainability is always a must. However, according to TBL, in order to form a real long-term sustainable pattern, all three dimensions need to be met simultaneously in the center of the three rings. A country may be economically sustainable. However, that economic sustainability won't last if social sustainability and environmental sustainability are not established simultaneously. Similarly, if a country is socially sustainable but not economically and environmentally sustainable, their social sustainability won't last long either. Therefore, if most countries in the world have focused a lot on their economic dimension, how about the other two dimensions - social dimension and environmental dimension? Have some countries in the world worked on the social dimension and environmental dimension in order to be completely and fully sustainable? If both developing countries and developed countries have put enough emphasis on economic sustainability, is there any differences between them in term of their effort on social sustainability and environmental sustainability? Next, RobecoSAM's country sustainability ranking will be used to examine the effort of major countries in the world on environmental dimension and social dimension.

1.2 RobecoSAM's Country Sustainability Ranking

The RobecoSAM Country Sustainability Ranking is an advanced tool, developed by RobecoSAM, an investment specialist focused exclusively on sustainability investing, for the purpose of helping its investors make investment decisions in that the resulting scores offer insights into the investment risks and opportunities associated with each country, and allow investors to compare countries to each other (Robeco and RobecoSAM's, 2013). RobecoSAM's country sustainability ranking uses the country sustainability framework on a broad range of environmental, social, and governance factors. Figure 2 shows the framework, which indicates how the three components (environmental component, social component, and governance component) combined affects a country's sustainability level. The framework itself is a precise reflection of sustainability according to the RBL theory and the definition of sustainability. Specifically, the country sustainability score is based on seventeen indicators, which are grouped into one of the three dimensions: environmental component, social component, or governance component. Three indicators are in environmental dimension with a weight of 15%; another three indicators are in social dimension with a weight of 25%; and the rest eleven are in governance dimension with a weight of 60%. Each dimension weight is the sum of the indicator weights within the respective dimension. The score ranges from 1 to 10, with the highest grade is 10 and the lowest 1 (Robeco and RobecoSAM's, 2013).

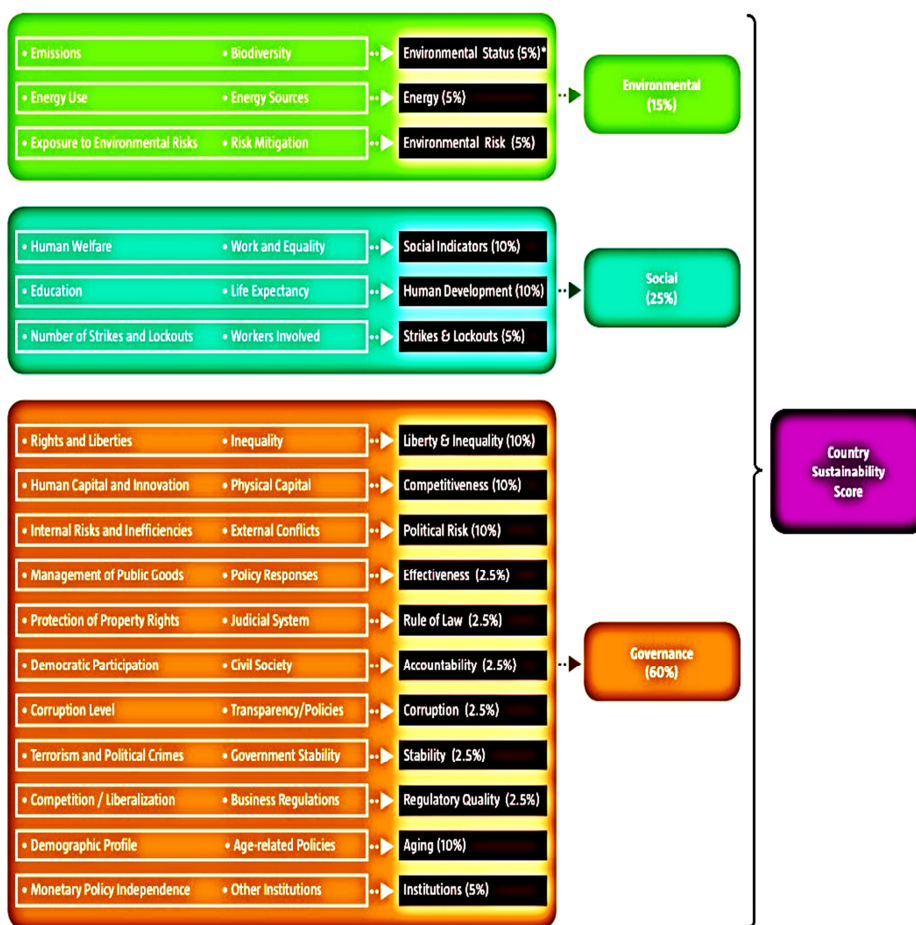


Figure 2. Country Sustainability Ranking Framework (Robeco and RobecoSAM's, 2013).

By following the framework above, fifty-nine countries are evaluated – twenty-one developed countries and thirty-eight developing countries. Figure 3 shows the country rankings and dimension/total sustainability scores in 2013. The orange bars show the scores in governance; the blue bars indicate the scores in social component; and the green bars show the scores in environmental component. When all three components are combined, the total scores range from the lowest of 2.51 to the highest of 8.25. The 2013 country sustainability overall ranking shows that most developed countries are ranked high in sustainability, whereas developing countries are ranked low in sustainability. This pattern supports a positive relationship between economic development and sustainability, meaning that the more developed a country is, the higher overall score of sustainability it has.

What if each of the three dimensions is examined separately? When three colored bars are studied independently, countries vary in green bars; vary in blue bars; and vary in orange bars. However, which color of bar forms the biggest range? Which color of bar shows the smallest range? As Figure 3 indicates, the orange bars forms the biggest range of variation from the lowest of 1.5 of Nigeria to the highest of 5 of Sweden. In contrast, the length of green bars across the fifty-nine countries is in the smallest range, which means that no matter whether it is a developed countries or a developing country, the environmental scores are quite similar. Similarly, the length of blue bar among all the countries is in a smaller range than the orange bars; meaning the social scores are not as greatly different among the countries as the difference of governance scores. What has set all the countries apart from each other, especially set developed countries apart from developing countries, is neither their environmental scores nor social scores. Instead, the economic component contributes the most to a country's overall sustainability ranking.

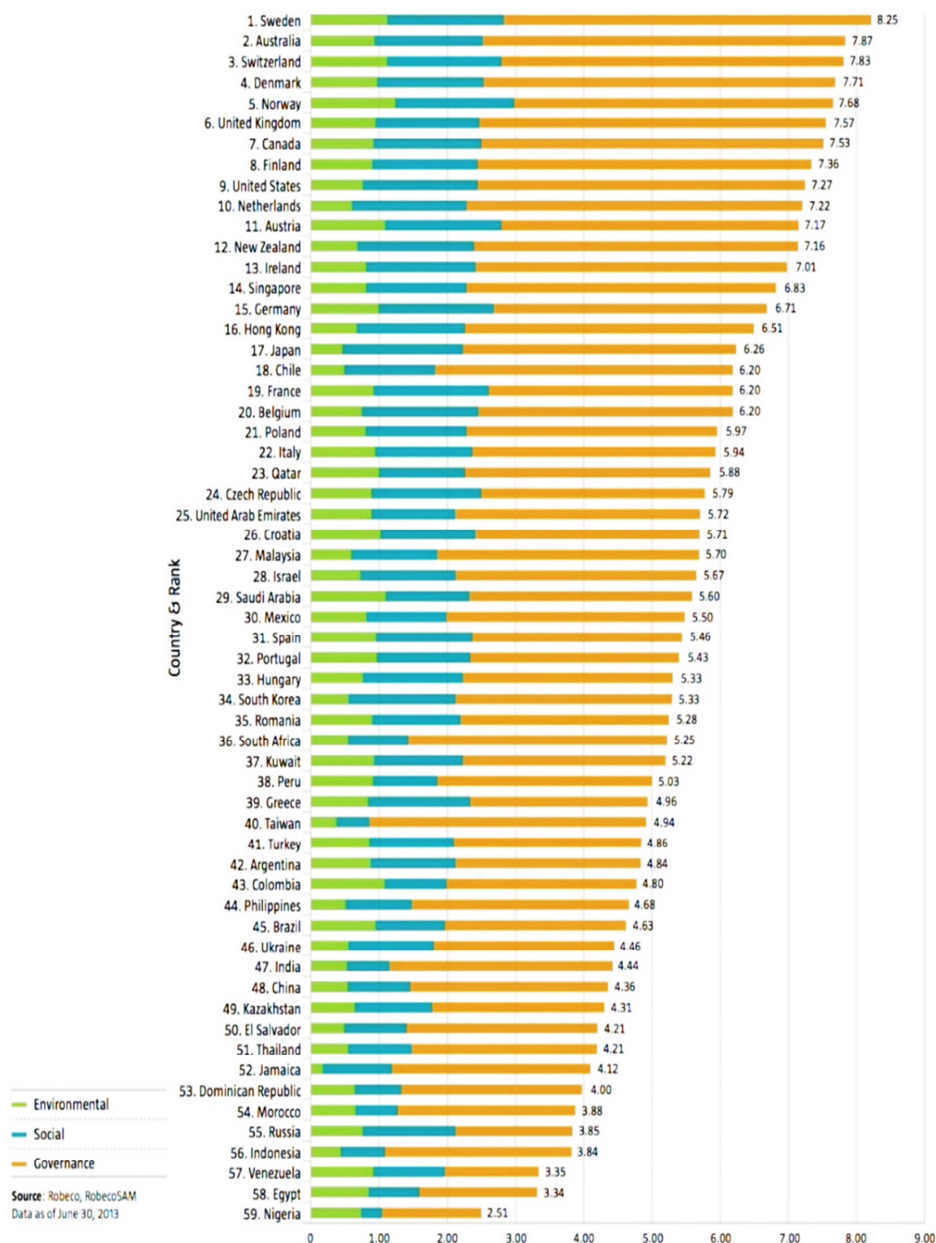


Figure 3. Dimensions & Total Sustainability Scores (Robeco and RobecoSAM's, 2013).

The above analyses show that the greatest differences among the countries lies in the economic dimension in that countries, especially developed countries who have put a great deal of effort on economic development. Economic sustainability has been the key mission for many countries for centuries. Businesses search for different strategies to be more cost-efficient and profit-driven (Asuquo & Akpan, 2013; Gupta, 2014). Governments try to develop or further improve national economy (Cameron, 1998; Maidment, 2009). Individual consumers are also very economically conscious (Boskin, Dulberger, Gordon, Griliches, & Jorgenson, 1998; Burdick & Fisher, 2007). What about social sustainability and environmental sustainability? The results above show that all countries hold similar scores in social dimension and environmental dimension. As shown in Figure 3, the difference in social scores ranges from Nigeria with 0.4 to Norway and France with 1.8. The difference in environmental scores is even smaller, ranging from Jamaica with 0.2 to Norway with 1.3. These data support that most countries have not put out enough effort into environmental sustainability and social sustainability, especially environmental sustainability. Developed countries are way ahead of developing countries in term of their economic development (economic sustainability). However, they do not show similar amount of differences in environmental dimension. The area where lacks the most effort and improvement in both developing and developed countries lies in environmental sustainability.

Therefore, based on the above analyses, the focus of this study is on environmental sustainability. Even though environmental sustainability has obtained more and more attention globally, many questions are still unclear. For example, are environmental sustainability and economic development related to each other? How are they correlated with each other? How economically developed a country needs to be when environmental sustainability become necessary? Does environmental sustainability require certain degree of economic development? The purposes of this study are: (1) to investigate the relationship between environmental sustainability and economic development; and (2) to examine the current status of environmental sustainability in both developed and developing countries; and (3) to develop a world view of environmental sustainability. When and how can developing and developed countries be environmentally sustainable? When can consumers in developing and developed countries be environmentally sustainable consumers? What can motive consumers in developing and developed countries be environmentally sustainable? Before consumers take any action, there is always a reason. Behind any kind of consumer behavior, there is always a motive. When will consumers be ready for being environmentally sustainable? They won't be ready until they have developed the right need and motive. Needs and motive determine consumers' final behavior (Chen-Yu, Hong, & Seock, 2010; Fotopoulos & Krystallis, 2002; Hudders, 2012; Kabadayi & Gupta, 2011). Therefore, studying consumer needs and motive is inevitable.

2. A Positive Relationship between Environmental Sustainability and Economic Development

2.1 Maslow's Hierarchy of Needs

Maslow's hierarchy of needs is a theory in psychology proposed by Abraham Maslow in 1943. Since then, Maslow's Hierarchy of Needs have been comprehensively examined, tested, and applied when consumer motivations are studied (Cao, Jian, Oh, Li, & Liao, 2013; Raymond, Mittelstaedt, & Hopkins, 2003; Zaichowsky, 2002). According to Maslow's theory, human need is developed on five different levels: (1) physiological needs – the physical requirements for human survival, including breathing, food, water, sex (reproduction), and sleep; (2) Safety needs – security of employment, resources, morality, the family, health, and property; (3) love and belonging – friendship, family, and sexual intimacy; (4) esteem – self-esteem, confidence, achievement, respect of others, and respect by others; and (5) self-actualization – morality, creativity, spontaneity, problem solving, lack of prejudice, and acceptance of facts. In these five levels of needs, level (1) and (2) are basic needs, (3) and (4) are psychological needs, and (5) is self-fulfillment needs (Maslow, 1943). These five needs show different incentives for consumers to purchase and consume products and explain why they want to make the purchase and consumption.

In the 1970s, Maslow added another two levels of need to his theory: cognitive needs and aesthetic needs (Maslow, 1970a). Then one more need was added, which is transcendence needs (Maslow, 1970b). At the end, an eight-level hierarchy was developed: (1) physiological needs; (2) safety needs; (3) love and belonging; (4) esteem; (5) cognitive needs; (6) aesthetic needs; (7) self-actualization; and (8) self-transcendence (Figure 4).



Figure 4. Maslow's Hierarchy of Needs (Maslow, 1970b)

In this more complete hierarchy, level (1) – (4) are coping needs, and level (5)-(8) involve in happiness or more detailed levels in self-actualization. The highest need of human being is called transcendence. Self-transcendence refers to the direct experience of a fundamental connection, harmony, or unity with others and the world. The meaning and value of life is more involved in the outside world rather than self, such as helping other individuals, other countries, other groups, and the whole entire environment. Transcendence needs motive people to help others with sympathy, care more about people around you than caring about yourself with universal brotherhood. While we help others, we are helping ourselves. Specifically, self-transcendence includes universalism and benevolence. Universalism covers understanding, tolerance, caring about welfare of all people and nature, including open mind, broad-minded, social justice, equality, world peace, beautiful world, unity with nature, inner harmony, and protect environment. Benevolence covers caring about well-being of close ones, including helpful, honest, forgiving, loyal, responsible, true friendship, and mature love (Koltko-Rivera, 2006).

It is clear that self-transcendence is closely tied to environmental sustainability. It is reasonable to assume that when consumers reach the level of self-transcendence, they will be ready to be environmentally sustainable. People who hold “self-transcendent” values are more likely to engage in sustainable behavior (Stern, 2000), show higher concern about environmental risks like climate change (Slimak & Dietz, 2006), are more likely to perform specific actions such as recycling (Dunlap, Grieneeks, & Rokeach, 1983) and are more likely to support climate mitigation policies (Nilsson, von Borgstede, & Biel, 2004). So when and how can an individual reach the level of self-transcendence?

In addition to the eight levels of needs, Maslow’s theory further requires that each individual needs must be satisfied at the lower levels before they progress to the higher, more complex levels. When low-level needs are satisfied, individuals are no longer motivated by them. According to these requirements, if an individual is struggling with physiological needs (level 1), s/he won’t have safety needs (level 2). If s/he gets physiological needs fulfilled, safety needs will become new needs for her or him. Then only when safety needs are satisfied, can an individual start to search for how to fulfill love and belongingness needs (level 3). So when will transcendence needs (level 8) emerge? Following the same reasoning and assumption, in order to reach the highest level – transcendence, all the previous levels of needs need to be met. Only when an individual is able to meet all the lower levels of needs (level 1 to 7), can transcendence needs become a new need for the individual to pursue and fulfill.

Maslow’s theory has been applied to different countries. Yalch and Brunel (1996) found that developing countries tend to focus on lower order needs (physiological and safety), whereas developed countries concentrate on higher order needs and only occasionally worry about satisfying lower order. Plummer (1989) also found that higher order needs have increased as a results of economic prosperity based on surveys conducted in the U.S., UK, and Germany in the 1980’s. Following the above analyses, it is reasonable to assume that in a developed country, when people have more levels of needs fulfilled, they are more likely to reach the level of self-transcendence; in turn, they should be more likely to be environmentally sustainable. In contrast, when most people are still struggling with physiological needs and safety needs in developing countries, the likelihood of being sustainable is rather slim since their needs are still several levels away from self-transcendence.

2.2. *Environmental Performance Index (EPI)*

The Environmental Performance Index (EPI) is a joint project between Yale Center for Environmental Law & Policy and the Center for International Earth Science Information Network at Columbia University, in collaboration with the Samuel Family Foundation and the World Economic Forum. The Environmental Performance Index (EPI) ranks how well countries perform on high-priority environmental issues in two broad policy areas: (1) protection of human health from environmental harm; and (2) protection of ecosystems. Within these two policy objectives the EPI scores country performance in nine issue areas comprised of twenty indicators. Indicators in the EPI measure how close countries are to meeting internationally established targets or, in the absence of agreed targets, and how they compare to the range of observed countries. The EPI is a global ranking of countries’ environmental results and can serve as an indicator of a nation’s environmental sustainability (Environmental Performance Index, 2014).



Figure 5. The EPI in 2014 (Yale University, 2014).

According to Figure 5, Environmental Health is measured by three factors: health impact (child mortality), air quality (household air quality, air pollution average Exp. To PM2.5, air pollution PM 2.5 exceedance), and water & sanitation (access to drinking water, access to sanitation). Ecosystem Vitality is determined by another six factors: water resources (wastewater treatment), agriculture (pesticide regulation, agricultural subsidies), forests (change in forest cover), fisheries (fish stocks, coastal shelf fishing pressure), biodiversity & habitat (critical habitat protection, marine protected areas, global biome protection, national biome protection), climate & energy (trend in CO2 Emissions per kWh, change of trend in Carbon Intensity, trend in carbon intensity). Following the framework showed in Figure 5, eleven countries EPI and their rankings in 2014 are included in Table 1. The rankings show that developed countries are more likely to rank higher on the list meaning that they are more environmentally sustainable than developing countries. For countries which are less economically developed (developing countries), they are less environmentally sustainable.

Table 1. Countries rank on the 2014 EPI (Yale University, 2014).

Country	EPI Score	Rank
Australia	82.4	3
Germany	80.47	6
UK	77.35	12
Canada	73.14	24
Japan	72.35	26
US	67.52	33
S Korea	63.79	43
Russia	53.45	73
Iran	51.08	83
China	43	118
India	31.23	155

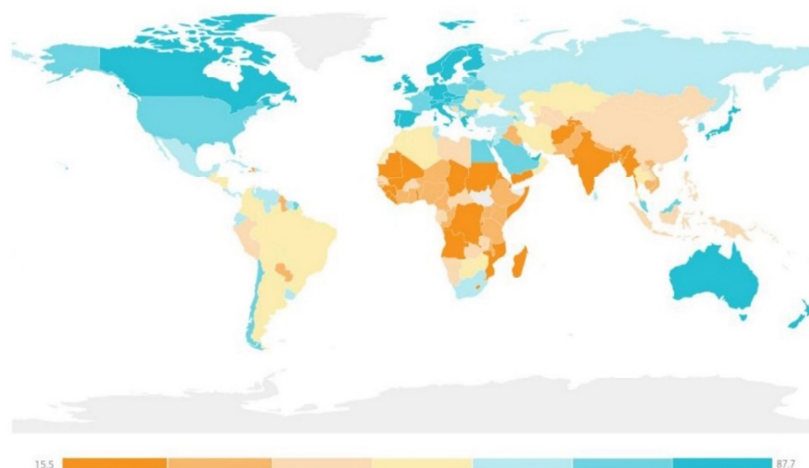


Figure 6. Global map of the 2014 EPI rankings (Yale University, 2014).

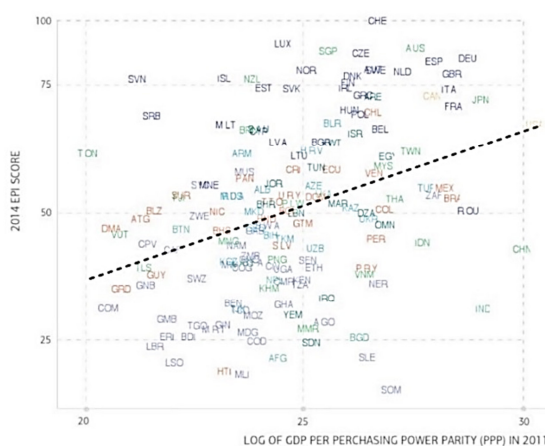


Figure 7. Relationship between GDP and the EPI (Yale University, 2014).

Figure 6 shows the global map of the 2014 EPI. As it indicates in Figure 6, all countries in Europe and North America are labeled in blue which means that they have higher EPI scores and they are more environmentally sustainable. Most countries in Africa, Asia, and Central and South America are labeled in yellow or orange which indicate lower EPI scores and less environmentally sustainable performance. When the relationship between a country's GDP and its EPI score is examined in Figure 7, a positive correlation is identified further supporting that the more economically developed a country is, the more environmentally sustainable that country is.

2.3 Relationship between Environmental Sustainability and Economic Development

Combining Maslow's Hierarchy of Needs and EPI, it is clear that there is a positive relationship between environmental sustainability level and economic development level. When a country is more developed economically, it's likely to be more environmentally sustainable. This positive relationship is not only supported by Maslow's Hierarchy of Needs based on the eight levels of needs, but supported by EPI, a data bank. Therefore, developed countries are more environmentally sustainable than developing countries, as shows in Figure 8.

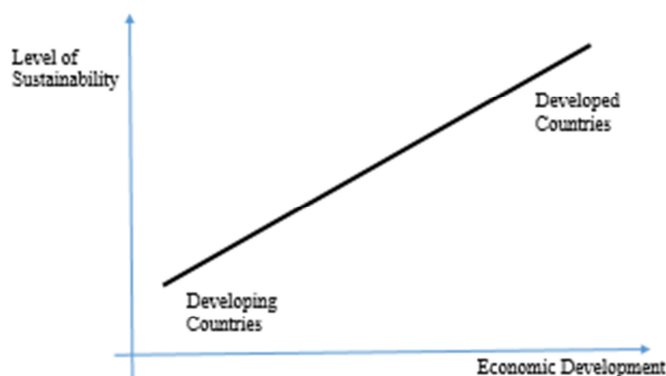


Figure 8. A Positive Relationship between Sustainable Level and Economic Development

3. A Negative Relationship between Environmental Sustainability and Economic Development

3.1 Greendex

Developed by National Geographic in 2008, Greendex measures consumer behavior in areas relating to housing, transportation, food, and consumer goods, as shows in Figure 9. It is a worldwide tracking survey, which ranks average consumers in seventeen countries according to the environmental impact of their consumption patterns. The seventeen countries include Argentina, Australia, Brazil, Canada, China, France, Germany, Hungary, India, Japan, Mexico, Russia, South Korea, Spain, Sweden, Great Britain, and United States (National Geographic, 2014). Consumers typically have little control over the manufacturing practices for the specific products that they purchase. But, they influence the level of environmental impacts from the manufacturing phase mainly by which products they choose to buy and how they use them. Consumers make choices that directly affect pollutant emissions levels. For example, consumers decide how fast to drive cars, how well to maintain vehicle pollution control systems, how warm or cool to keep homes, how much food to throw away, and how carefully or carelessly to use household cleaning, lawn and gardening products.

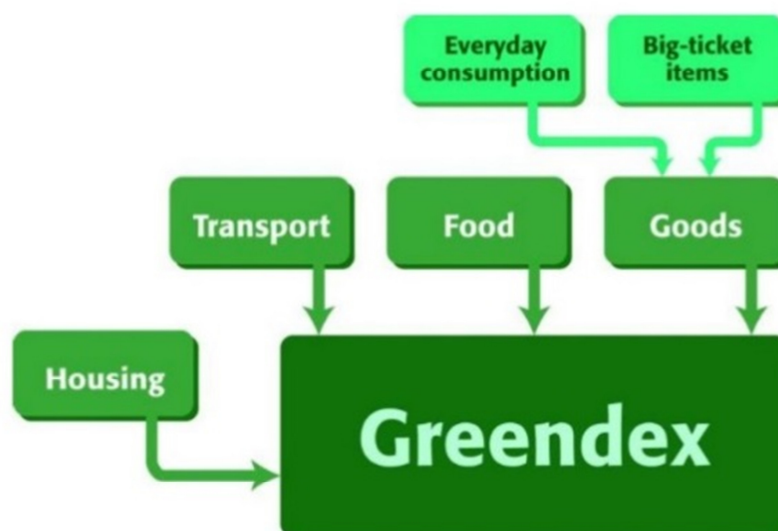


Figure 9. Greendex Measurement (Walter, 2012).

The Greendex in 2012 surveyed approximately a thousand adult consumers age 18 and older in each of seventeen countries. The survey was quantitative in nature and included questions on food source and consumption, transportation, energy use, waste disposal, purchase of environmentally friendly products, and attitudes and opinions toward a variety of related issues. The data for each country were weighted according to the latest census data to reflect the demographic profile of each country (National Geographic, 2014). The top-scoring consumers of 2012 are in the developing economies of India, China, and Brazil, in descending order. Those in emerging economies continue to round out the top tier of the Greendex ranking, while the lowest scores are all earned by consumers in developed countries. American consumers' behavior still ranks as the least

sustainable of all countries surveyed since the inception of the study, followed by Canadian, Japanese, and French consumers (National Geographic, 2014).

Figure 10 shows the Greendex results 2008-2012. Even though the results show that there are changes from year to year for each country, it is consistent in a way that the consumers in developed countries, such as the U.S., Canada, Japan, France, Australia, UK, Sweden, Spain, and Germany, have lower Greendex scores than consumers in developing countries, such as India, China, and Brazil. The 2014 Greendex report shows that the top three countries are India, China, and South Korea, and the bottom three countries are Japan, Canada, and the U.S. (National Geographic, 2014).

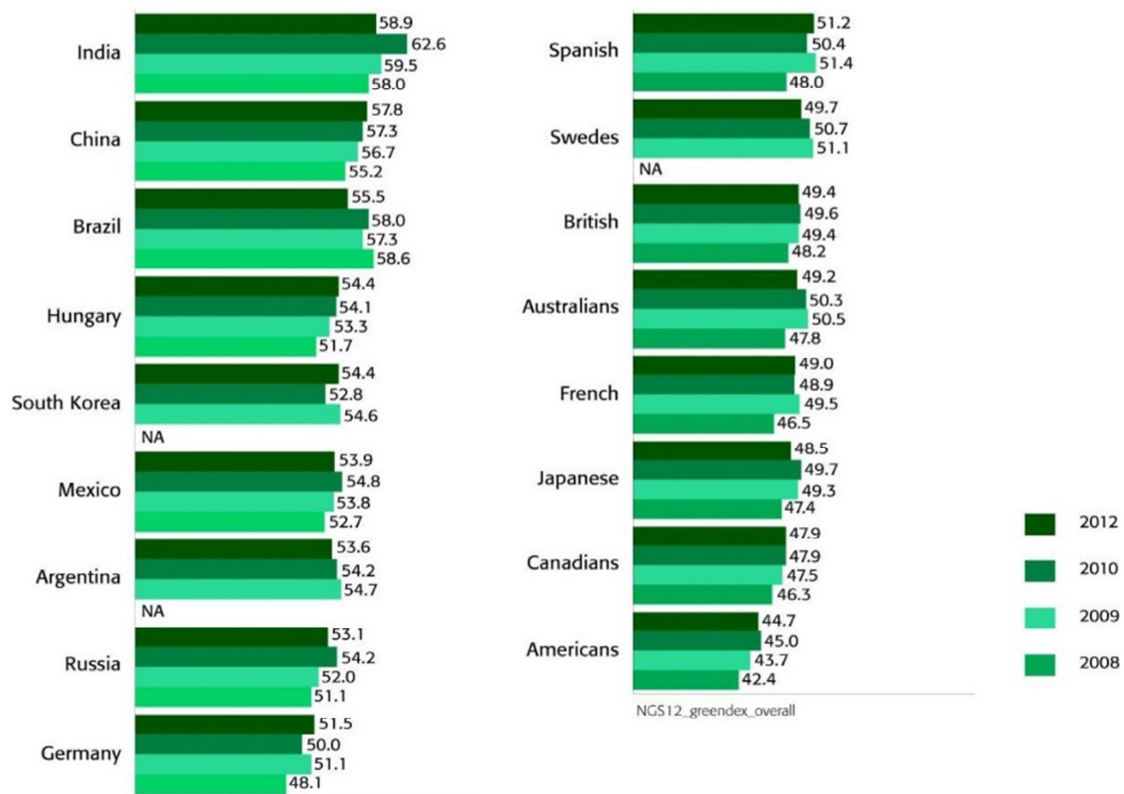


Figure 10. Greendex: Overall Rankings 2008-2012 (National Geographic, 2014).

3.2 Other Statistics

In addition to Greendex, there are more statistic data available in term of environmental impact from different countries. In the following section, four of such are reviewed: emission of CO₂, energy consumption, ecological footprint, and waster generation. Because each country varies dramatically in population, all the four groups of data are examined on the basis of per capita in order to make them consistent and comparable.

3.2.1 Emission of CO₂ and Energy Consumption

The increase in global emissions of carbon dioxide (CO₂) is a major source of environmental degradation. Every year, all countries release CO₂ in different formats. Table 2 shows the emission of CO₂ per capita from eleven countries in 2009. Developed countries, such as U.S., Australia, and Canada emitted far more CO₂ than developing countries, such as China and India.

Table 2. Emission of CO2 per Capita 2009 (PBL Netherlands Environmental Assessment Agency, 2013)

Country	Emission of CO2 per capita (tonnes)
US	18
Australia	18
Canada	16
Russia	11
S Korea	11
Germany	10
Japan	9
Iran	8
UK	8
China	6
India	2

Energy consumption refers to primary energy before transformation to other end-use fuels, which is another key indicator of environmental impact. Table 3 includes the energy consumption per capita from the same eleven countries as Table 2 includes in 2009, which shows a huge disparity between the highest energy users and the lowest, and the huge disparity primarily reflects different income levels throughout the world. The top three countries are Canada, the US and Australia, which are all developed countries. The bottom three are China, India, and Iran, which are all developing countries.

Table 3. Energy Consumption per Capita 2009 (U.S. Energy Information Administration, 2014).

Country	Energy consumption per capita (kilograms of oil equivalent)
Canada	6636
US	6486
Australia	5929
Russia	4364
S Korea	3466
Germany	3241
UK	3036
Japan	3003
Iran	2750
China	1431
India	439

3.2.2 Ecological Footprint

Ecological footprint, developed by Global Footprint Network, measures human consumption of natural resources in comparison to Earth's ecological capacity to regenerate them. Individually, each consumer has "a footprint," and, collectively, they aggregate across geographical zones and other means of classification. Calculation of the footprint takes into account just about everything we do; from the food we eat, to the house we live in, to the car we drive and the other consumption habits we practice each day. It's a very complex calculation that answers a straightforward question: how much of the Earth's resources do our lifestyles require? Footprint analysis is useful for determining to what extent a nation uses more (or less) than is available within its borders, or to what extent the nation's lifestyle would be replicable worldwide (Global Footprint Network, 2014).

Figure 11 shows a world view of ecological footprint in 2012 using a traffic-light system whereby thresholds for "good" (green), "middling" (amber), or "bad" (red) performance are used. The Ecological Footprint highlights that it is still the wealthiest nations, such as the U.S. and Canada, marked in red indicating that they have the most to do in terms of reducing environmental impact. Most people living in developing countries, such as India and China, consume at levels that do not take us beyond planetary limits (Happy Planet Index, 2014). Currently, according to the ecological footprint calculator at the Earth Day Network, if everyone in the world lived like the average U.S. citizen -- that is, had similar eating, transportation, living, and consumption habits -- we'd need 5 1/3 planets to support ourselves; the planet has about 4.5 biologically productive acres for each person in the world, and the average ecological footprint in the U.S. is 24 acres (Earth Day Network, 2014).

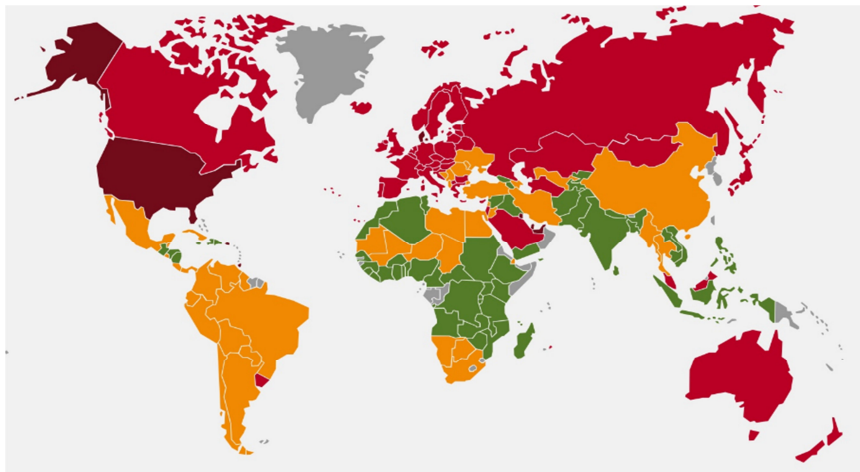


Figure 11. Ecological Footprint Worldwide per Capita (Happy Planet Index, 2014).

3.2.3 Waste Generation

Waste generation refers to the quality of materials or products that enter a waste stream before composting, incinerating, landfilling, or recycling. Figure 12 shows the relationship between waste generation and GNP in 2009, which indicates very significant differences in waste produced from households with increasing affluence in each country. Specifically, the higher the economic development and the income level, the greater the amount of waste generation (The Envirobiz Group, In., 2010).

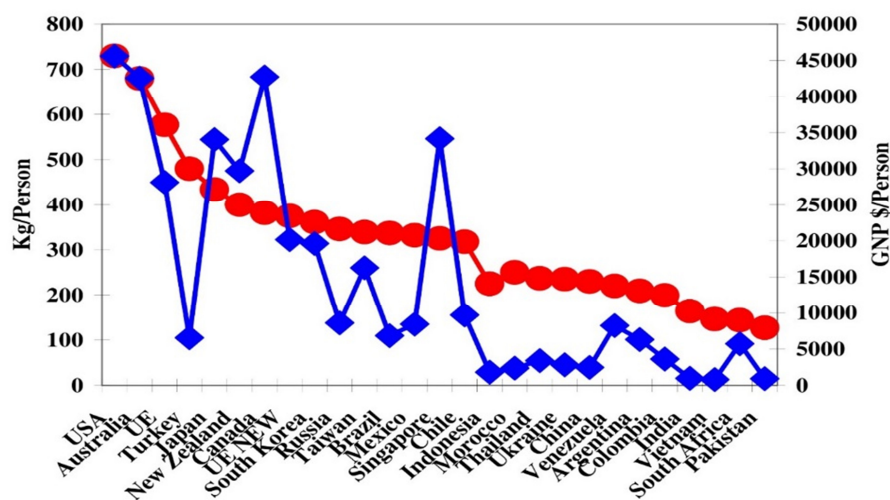


Figure 12. Waste Generation vs. GNP, 2009

3.3 Relationship between Environmental Sustainability and Economic Development

All the above four groups of data along with Greendex show a very clear pattern between environmental impact and economic development. When a country is more economically developed, it often causes a more negative environmental impact. Therefore, developed countries are less environmentally sustainable than developing countries. People living in developing countries are more environmentally sustainable. In contrast, consumers in developed countries are less sustainable. There is a negative relationship between environmental sustainability level and economic development level. The richer a country is, the further away it is from being environmentally sustainable, as shows in Figure13.

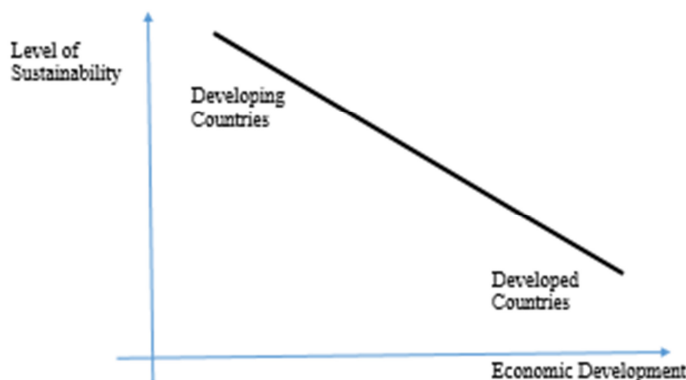


Figure 13. A Negative Relationship between Sustainable Level and Economic Development

4. Environmental Sustainability Curve (ESC)

4.1 Two Types of Environmental Sustainability

The analyses based on Maslow's Hierarchy of Needs combined with EPI lead to a finding of a positive relationship between economic development and environmental sustainability level; meaning that the more developed a country is, the more environmentally sustainable it is. In contrast, the analyses based on Greendex and other statistical data lead to an opposite direction showing a negative relationship between economic development and environmental sustainability level, because consumers in developing countries are more environmentally sustainable than those in developed countries.

Why are the findings conflicting with each other, when both positive relationship and negative relationship are supported by theories and statistical data? Could both types of rules correct? Both rules present the relationship between economic development and environmental sustainability level. But the two different rules raise a question – could these two rules indicate a relationship between economic development and two different types of environmental sustainability? If the answer is “yes”, what are these two different environmental sustainability?

Looking at the positive relationship between economic development and environmental sustainability, consumers in developed countries show higher environmental sustainability than consumers in developing countries. Because consumers in developed countries are getting closer to the level of self-transcendence in Maslow's Hierarchy of Needs and self-transcendence are related to the meaning and value of life more involved in the outside world rather than self, such as helping other individuals, other countries, other groups, and the whole entire natural and social environment. That means consumers at this level are willing to take an active role to be more sustainable voluntarily even if they have to sacrifice their life style. A good way to reflect this kind of environmental sustainability is to name it Proactively Environmental Sustainability. *Proactively Environmental Sustainability* refers to consumers who take a more proactive role in their life in that even though they have the ability to afford and consume more products, they want to fulfill their transcendent needs; in turn, they consume less voluntarily which leads to a lower environmental impact. Maslow's Hierarchy of Needs and EPI support proactively environmental sustainability. As shows in Figure 14, the more economically developed a country is, the closer its people are to the level of transcendence, and when its people reach the level of transcendence, they will care more about the nature, and the harmony between the human being and the environment; and in turn, they will have a high level of proactively environmental sustainability. However, in developing countries, consumers still struggle with basic survival needs, they have to focus on the bottom levels in Maslow's Hierarchy; in turn, they will have the lowest level of proactive sustainability. So the relationship between the level of Proactively Environmental Sustainability and the economic level follows a positive rule as shows in Figure 14.

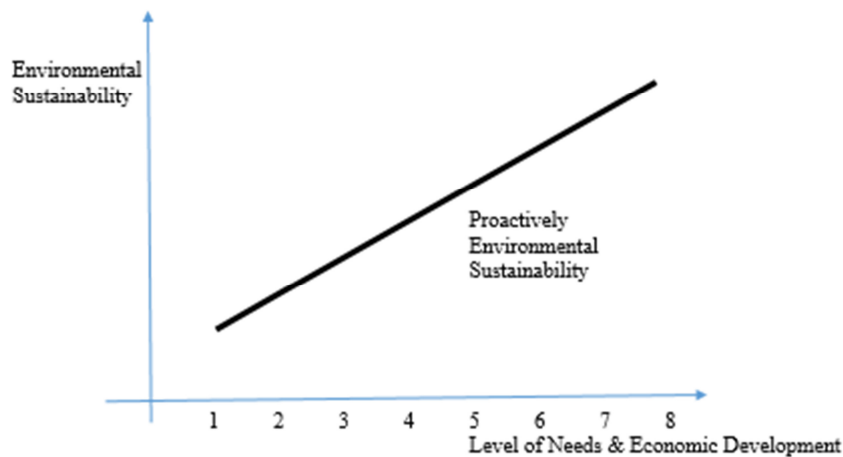


Figure 14. Proactively Environmental Sustainability

Looking at the negative relationship between economic development and environmental sustainability, consumers in developing countries show higher environmental sustainability than consumers in developed countries. Because consumers in developing countries have less resources and income to meet their needs. When consumers in developed countries have multiple TV sets in their house, consumers in developing countries can't afford even one. When consumers in developed countries have multiple automobiles in their household, consumers in developing countries can't afford even one car. As a result, consumers in developing countries will have a lower environmental impact. However, consumers in developing countries do not voluntarily choose not to have a TV set or a car; rather, they are forced to have the life style they have. A good way to capture this kind of environmental sustainability is to name it Passively Environmental Sustainability. *Passively Environmental Sustainability* refers to consumers who show environmental sustainability evidence passively because they do not have all the means and resources to consume, so they have a lower level of consumption; in turn, they have a lower environmental impact. Greendex and other statistical data discussed above support passively environmental sustainability. Passively environmental sustainability tends to be the highest when an individual is still trying to meet the physiological needs. Therefore, the lower level of the needs is in Maslow's Hierarchy of Needs, the less environmental impact an individual has. Specifically, developing countries are mainly agriculture-sector oriented and majority of their people are still struggle with basic survival needs. With limited income and sources, they would have high level of environmental sustainability, more specifically, passively sustainable level. When consumers have more sources and more disposable income, they will start to purchase and consume more products even when it's not needed. This applies to consumers in developed countries. The relationship between the passively environmental sustainability and economic development follows a negative rule as shows in Figure 15.

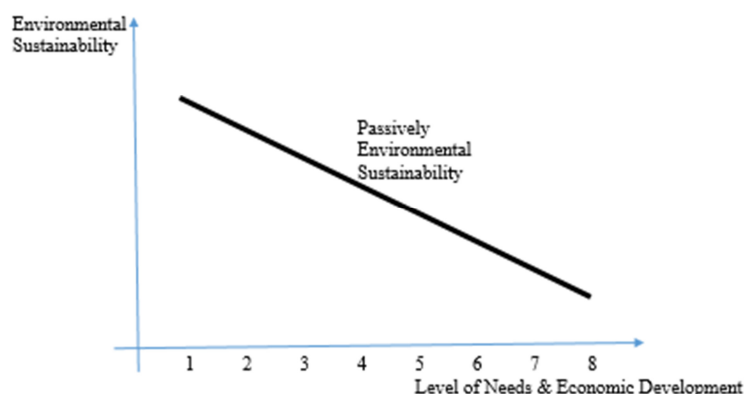


Figure 15. Passively Environmental Sustainability

The key difference between proactively environmental sustainability and passively environmental sustainability lies in the consumer motive influenced by the economic level. Proactively environmental sustainability is motivated by consumer need of self-transcendence, whereas passively environmental sustainability is caused by consumer survival needs. Even though the drives behind these two types of environmental sustainability are

different, the results are the same – low environmental impact. If both environmental sustainability lead to the same results – low environmental impact, what if we combine both Figure 14 and 15 together to examine the relationship between economic development and environmental sustainability regardless of the type of environmental sustainability? In developing countries, at level 1, even though proactive sustainability is at the lowest level, passive sustainability reaches the highest level, which drives the overall environmental sustainability (proactive sustainability and passive sustainability combined) high. In developed countries, at level 8, even though passive sustainability is at the lowest level, the proactive sustainability reaches the highest level, which can also drive the overall environmental sustainability (proactive sustainability and passive sustainability combined) high. At level 4 and 5, consumers have not reached level 8 – self-transcendence yet. As a result, proactive sustainability is low. Meanwhile, consumers at level 4 and 5 do not struggle with basic survival any more. Then passive sustainability is low as well. Therefore, the overall sustainability level (proactive sustainability and passive sustainability combined) is lower at level 4 and 5 than consumers at level 1 and level 8. With both ends (level 1 and level 8) higher than the middle section (level 4 and level 5), a “U” shaped curve can emerge as shows in Figure 16. As indicated in Figure 16, individual consumers are passively sustainable when they are poor. Then the richer they are, the less passively sustainable they are. When they reach to the lowest level of being passively sustainable, proactively sustainable consumption will start to kick in because the individual consumers will strive to reach higher level of needs. The closer they are toward the transcendent level, the more proactively sustainable they are. Therefore, a “U” shaped Environmental Sustainability Curve (ESC) is formed as indicated in Figure 16.

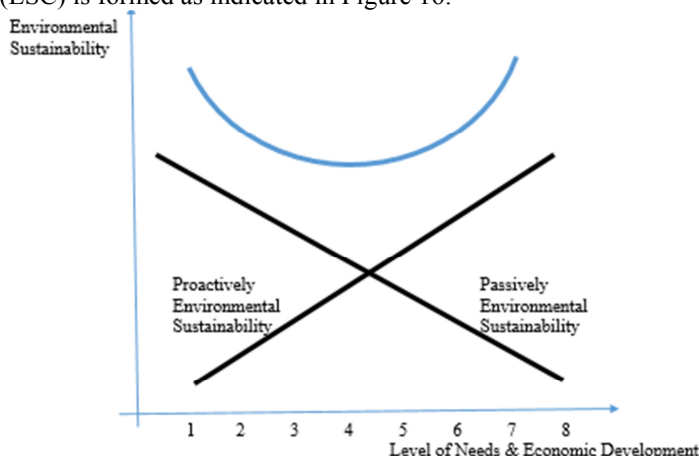


Figure 16. Environmental Sustainability Curve (ESC)

4.2 The Environmental Kuznets Curve (EKC) and Environmental Sustainability Curve (ESC)

Emerged in the early 1990's, the Environmental Kuznets Curve (EKC) shows a relationship between various indicators of environmental degradation and income per capital. In the early stages of economic development, the higher income per capital relates to more environmental degradation. But when income per capital is high enough, the trend will reverse, so that a high income level leads to environmental improvement. The turning point is caused from a shift in technology, policy, and reductions in the use of raw materials and shifts to renewable resources (Panayotou, 1993). This inverted “U” shaped income-pollution curve is Environmental Kuznets Curve (EKC).

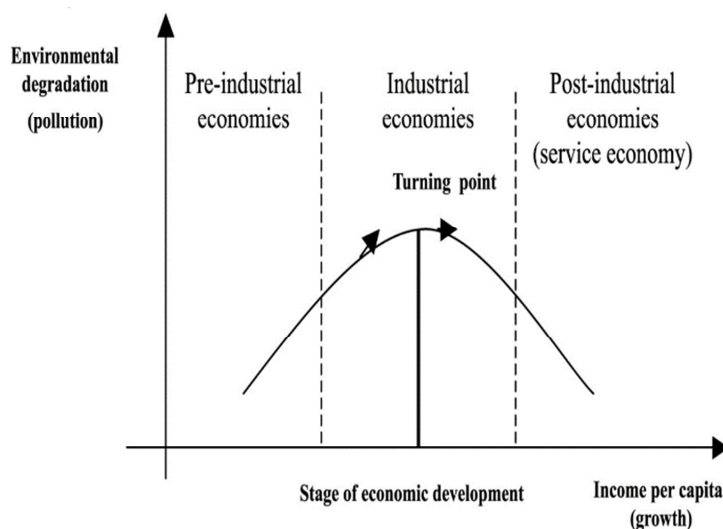


Figure 17. The Environmental Kuznets Curve (EKC) (Panayotou, 1993)

As shown in Figure 17, pre-industrial economies which are similar to developing countries tend to have a lower level of pollution. Industrial economies which refer to the countries that start to move away from agricultural economies to more industrialized countries tend to have a higher level of pollution. This occurs “because at this stage countries tend to value economic development over environmental quality, but as they achieve greater wealth they are willing to devote greater resources to environmental quality improvements” (Panayotou, 1993). Then when a country continues the economic development and reaches post-industrial economies, which is similar to developed countries, the pollution level will drop down. Industrial economies tend toward highly polluting heavy industry, while post-industrial economies rely on relatively clean advanced technology as well as service-sector businesses. Meanwhile, clean air, water, and environment provide an enjoyment that is income elastic. So as income increases above a threshold individuals and society will want to spend a larger share of their incomes on these goods, reducing the pollution per unit of output and perhaps even total pollution (Panayotou, 1993).

According to Panayotou (2003), the following three reasons may lead the inversion of pollution: (1) When a country is more affluent, it will place greater value on the cleaner environment and thus put into place institutional and non-institutional measures to affect this. (2) Pollution increases at the early phase of a country’s industrialization due to the setting up of rudimentary, inefficient and polluting industries. When industrialization is sufficiently advanced, service industries will gain prominence. This will reduce pollution further. (3) When a country begins industrialization, the scale effect will take place and pollution increases. Further along the trajectory, firms switching to less-polluting industries results in the composition effect, which levels the rate of pollution. Finally, the technique effect comes into play when mature companies invest in pollution abatement equipment and technology, which reduces pollution.

Is the upside-down “U” shaped EKC and “U” shaped Environmental Sustainability Curve (ESC) related to each other? In ESC, the relationship between economic development and environmental sustainability is presented. In EKC, the relationship between a country’s economic development and environmental pollution is shown. When a country’s economic level is at pre-industrial stage, the income per capita is still at the lowest level, and the country is categorized as a developing country. People living in that country often try to get their physiological needs met. Therefore, they are sustainable; more specifically, they are passively sustainable. When a country reaches post-industrial level, it is a developed country and the income per capita gets to the highest level in EKC. Living in this kind of country, consumers are more likely to get to the level of transcendent needs, and in turn, they are sustainable; more specifically, they are proactively sustainable. The middle stage in EKC, industrial economies, where developing countries are working to transition to developed countries, tend to have the highest level of environmental pollution. This goes well with the ESC, where consumers who live in countries during the middle stage have got their physiological and safety needs met, and are working to fulfill their love/belongingness and esteem needs. However, they have not reached the transcendent level. Therefore, their sustainable level tends to be the lowest. Therefore, EKC supports the proposed U-shaped ESC, and further supports the proposed two types of environmental sustainability. Consumers in developing countries are poor and limited on resources, so they are passively sustainable.

Consumers in developed countries are more likely to get to the level and transcendence. As a result, they should be more likely to be proactively sustainable.

5. Environmental Sustainability: A World View

5.1 Product Life Cycle

The above analyses found two different correlated relationship between environmental sustainability level and economic development: one is a positive relationship and the other is a negative relationship. Both relationships are developed based on statistical data including EPI, Greendex, emission of CO₂, energy consumption, ecological footprint, and waste generation. Why these two relationships are opposite from each other? How to explain the two different correlated relationships? A closer examination shows that these statistical data can be categorized into two groups: (1) Group One includes indicators of country's overall environmental performance, such as EPI; and (2) Group Two includes variables specifically related to consumer consumption such as Greendex, emission of CO₂, energy consumption, ecological footprint, and waste generation. Specifically, EPI in Group One investigates country's overall performance in two broad policy areas: (1) protection of human health from environmental harm; and (2) protection of ecosystems. In Group Two, Greendex measures consumer behavior in areas relating to housing, transportation, food, and consumer goods; emission of CO₂ indicates carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring; energy consumption is the consumption of energy or power; ecological footprint measures human consumption of natural resources in comparison to Earth's ecological capacity to regenerate them; and waste generation indicates waste produced from households during their consumption process. The negative correlation between environmental sustainability and economic development is supported by all variables in Group Two focusing on consumer consumption. It further approves that when consumer consumption is the focus, developed countries have lower environmental sustainability level than developing countries have; this negative correlation is mainly caused by higher consumption level in developed countries than that in developing countries. Then what happens before the consumption stage? What happens after the consumption stage?

According to a product life cycle, the stage prior to consumption stage is production stage; and the stage after consumption stage is disposal stage. A country's environmental status is mainly determined by its performance at three stages: (1) product production stage; (2) product consumption stage; and (3) product disposal stage (Washington State Department of Ecology, 2007). Product production stage has impact on environment on different levels. Different types of products, materials, services, or industries require resource use and emissions throughout the supply chain. Different sectors can vary dramatically in terms of their environmental impact. The second factor comes from products consumption or "use" phase impact. Even though consumers have little control over the manufacturing practices for the specific products that they purchase, they can influence the level of environmental impacts by what to buy and how to use. For example, consumers can determine how many cars they want to own, how warm they want to keep their rooms in winter, how often they water their lawn, and how often they take a shower. The last factor involves in product disposal stage. Many products are thrown into landfills and others end up down the drain. When a product reaches the end of its useful life, consumers make choices about what to do with the product: reuse, recycle, compost it, or throw it in the garbage. These decisions directly affect pollutant emissions. According to the above discussion, the following equation is developed:

Equation 1:

Total Environmental Impact = environmental impact of production + environmental impact of consumption + environmental impact of disposal

5.2 Product Life Cycle, Environmental Sustainability, and Economic Development

5.2.1 Developed Countries

Today, in developed countries, most products in the market are not manufactured by themselves; instead, the products are made in developing countries, and then shipped to developed countries (Fishlow, Carriere & Sekiguchi, 1980). Meanwhile, the industry developed countries focus on is mainly service industry (United Nations Industrial Development Organization, 2009). Therefore, the environmental impact from production is low in developed countries. In addition, after consumers in developed countries finish enjoying the products, quite often the used and disposed products are shipped back to developing countries (Willen, 2008). As a result, the environmental impact from disposal stage is low in developed countries as well. Then the main environmental impact in developed countries comes from the stage of consumption. Consumers in developed countries get to enjoy the final products without eye witnessing and first-hand experiencing the environmental impact during production and disposal stages. That's why they may not feel guilty about mass consumption (Yale University, 2014). The overall environmental impact in developed countries today is mainly contributed by the high volume of consumption. Developed countries often point to their declining CO₂ emissions and

improving local environments as evidence of having taken sustainability seriously, but the reality is that the lifestyles of people living in those countries still contribute to environmental degradation; they have simply “exported” this damage to the low income countries where the products they consume are produced (Happy Planet Index, 2014). Built based on Equation 1, the following equation is developed:

Equation 2:

Total Environmental Impact in developed countries = LOW environmental impact of production + HIGH environmental impact of consumption + LOW environmental impact of disposal

5.2.2 Developing Countries

Because the main production now a days is kept in developing countries, which has caused water pollution, air pollution, and soil pollution in natural environment, and damage to human health. The environmental impact caused by consumption stage is still low in developing countries. However, the environmental impact caused by production stage and disposal stage is much higher in developing countries, which contributes to the high environmental impact. In developing countries, people make production for developed countries. But they do not get chance to consume those products. When people in developed countries finish enjoying the products made in developing countries, they dispose the used products back to developing countries (Willen, 2008). Based on Equation 1, the following equation is developed:

Equation 3:

Total Environmental Impact in developing countries = HIGH environmental impact of production + LOW environmental impact of consumption + HIGH environmental impact of disposal

According to EKC, the environmental degradation of post-industrial economies are lower than industrial economies. How could that be possible? Shifting the production to industrial economies made it possible, which mean the environmental degradation is shifted from post-industrial economies to industrial economies. If people in developed countries slow down their consumption, the pollution generated by producing those products in developing countries will be lessened accordingly. Therefore, adding the high consumption volume, high production requested by the high consumption demand, and high disposal volume after consumption, the environmental impact from developed countries is much higher than developing countries. For the entire human being, we only have one Earth. No matter where the environmental degradation is moved to, it is still on the Earth. So if we combine developing countries and developed countries together to see the world as a whole, what is the world view?

5.2.3 A World View

The above analyses show the different environmental impact between developed countries and developing countries. When the environmental impact from consumption is high in developed countries, the environmental impact from consumption is relatively low in developing countries. When the environmental impact from production and disposal is low in developed countries, the environmental impact from production and disposal is relatively high in developing countries. Consumers in developed countries are more likely to be proactively sustainable because they have low production and low disposal level. Consumers in developing countries are more likely to be passively sustainable because they have low consumption level. In other words, proactive sustainability in developed countries is more likely to be contributed by low production and low disposal, whereas passive sustainability in developing countries is more likely to be contributed by low consumption. It seems like that either type of country can achieve some level of low environmental impact in some of the three stages. Consumers in developed countries may feel pretty good because they have low environmental impact due to low production volume and low disposal volume, whereas consumers in developing countries may feel pretty good because they have low environmental impact due to low consumption volume. However, the developing countries can't exist without the developed countries, and the developed countries can't exist without the developing countries. Therefore, it is necessary to look at the world as a whole by combining both developed countries and developing countries. Therefore, if we combine equation 2 and equation 3, equation 4 is formed as follows:

Equation 4:

Total Environmental Impact in World = HIGH environmental impact of production + HIGH environmental impact of consumption + HIGH environmental impact of disposal

The similar information is presented in Table 4. The ESC shows the environmental sustainability level of individual country; but if all countries are put together to see the world as a whole, due to the high environmental

impact caused by high production and high disposal from developing countries, and the high environmental impact caused by high consumption from developed countries, the world view to the environmental reality is very troublesome and serious in that all three stages in product life cycle generate high environmental impact and affect environment negatively.

Table 4. A World View of Environmental Sustainability

	Countries	Production	Consumption	Disposal
Row 1	Developed Countries	Low	High	Low
Row 2	Developing Countries	High	Low	High
Row 3 =Row1+Row2	A World View	High	High	High

6. Conclusions

The purposes of this study are: (1) to investigate the relationship between environmental sustainability and economic development; and (2) to examine the current status of environmental sustainability in both developed and developing countries; and (3) to develop a world view of environmental sustainability. By applying well-developed theories (Maslow's Hierarchy of Needs and the Environmental Kuznets Curve) and analyzing reliable statistical data (Environmental Performance Index, Environmental Performance Index, CO2 emission, energy consumption, ecological footprint, and waste generation), two correlated relationships (positive vs. negative) between environmental sustainability and economic development were identified, following by the development of two types of environmental sustainability (proactive vs. passive). When both correlated relationship were combined, the Environmental Sustainability Curve was developed and supported by the Environmental Kuznets Curve. Then by following product life cycle, the current status of environmental sustainability in both developed countries and developing countries were examined. At the end, when the world was examined as a whole by combining the developing countries and developed countries together, a world view of environmental sustainability was formed. Even though developed countries have a low environmental impact from production stage and disposal stage and developing countries have a low environmental impact from consumption stage, the world view combined with both types of countries is very troublesome and serious due to high environmental impact from production, consumption and disposal. Therefore, immediate response to address all the environmental damages is necessary from all countries.

Developed countries should not have excuse from low environmental impact from production and disposal because in order to support their mass consumption, high production level and high disposal level are inevitable. Even though the required high volume of production and disposal does not occur in developed countries (rather, in developing countries), it still happens on the Earth every day. Without eye-witnessing and first-hand experiencing severe water pollution, air pollution, and many other negative impact on the environment caused by high volume of production and disposal, consumers in developed countries may feel less guilty and less motivated to be environmentally sustainable (Walter, 2012). Therefore, in developed countries, consumer education and policy implication become critical in order to lower the mass consumption level. Well-developed educational programs, new policy and regulations on business practices and consumer consumption pattern need to be developed and implemented immediately because if developed countries want to wait till all their people reach the level of self-transcendence, the Earth will be destroyed irreversibly.

Developing countries should not have excuse from low environmental impact from consumption, nor have excuse of lacking enough economic development to support their people's basic survival needs. If basic survival needs are the main focus for many developing countries, having a clean living environment with clean water and food is part of basic survival needs. How to rely on more environmental friendly production and disposal processes for economic development should replace any development plan with no environmental sustainability concerns.

This paper is not an empirical study, nor a typical theory-development study. However, built on well-developed theories and solid statistical data, this paper made several key contributions. First, on the theoretical level, this study developed two types of environmental sustainability and proposed Environmental Sustainability Curve, which can bring fundamental contribution to the current sustainability research in the academic world. Second, by following a product life cycle, this study examined the environmental sustainability status in both developing and developed countries, which can help government in both types of countries better develop their policies and regulations to tackle different issues. Third, this study also developed a world view of environmental sustainability which presents a serious, urgent, and realistic look to the world as shows in Equation 4. Immediately, environmental sustainability should become a must-have mission for all countries, businesses, organizations, and consumers. No more postpone and delay is allowed.

Future studies can take a step further to look at how developed countries can get environmentally sustainable, and to identify effective short-term and long-term strategies and immediately-effective policies for developed countries. Similarly, how can developing countries get environmentally sustainable? What are effective short-term and long-term strategies and immediately-effective policies for developing countries? In

addition, researchers may argue that sustainability is not solely driven by economic development level. Besides economic development, are there other factors affecting environmental sustainability? What about values, norms, traditions, and culture? Can certain type of ideology further help environmental sustainability or slow down the pace of environmental sustainability? Answers to these questions are also important for the future.

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