

# Linking Globalization and Extinction Rates: A Statistical Analysis of the Effects of Globalization on Biodiversity

Lauren Hansen

*The negative effects of globalization upon the natural environment have come to the forefront of national discussion. Many people are concerned with global warming and the decline of species across the world. Increases in economic liberalism have failed to take into account the influences of unregulated free trade upon biodiversity. The focus has remained firmly on economic gains and profit. This seems to have dire consequences for biodiversity through habitat loss and the overconsumption of materials. In order to look at these effects, statistical links between globalization, CO<sub>2</sub> emissions as a measure of industrialization, and the amount of threatened animals in a country will be analyzed. Correlations can be drawn between globalization and economic factors that illustrate negative effects upon threatened animals in the models presented. Economic liberalism is revealed to be a source of many of the problems related to environmental degradation; however, institutional liberalism may be able to provide some solutions through international agreements and stronger preservation efforts.*

---

“There are some who can live without wild things and some who cannot....Like winds and sunsets, wild things were taken for granted until progress began to do away with them. Now we face the question whether a still higher ‘standard of living’ is worth its cost in things natural, wild, and free.”

—Aldo Leopold, *A Sand County Almanac*, 1949

For the past 50 years, free-trade and economic growth have overridden any claims that have been made for the preservation of the natural environment, all in the name of progress. However, this abuse of the natural environment has been brought to the forefront as of late with claims of global warming and species disappearing daily, never to return. As Jan Aart Scholte points out in his book *Globalization*, annual species extinctions have increased exponentially from six in 1950 to 10,000 in 1990 (Scholte, 2005). This rise in globalization and extinction rates is not coincidental, with some such as Richard Leakey and Roger Lewin calling this the “sixth extinction,” comparable with the extinction of dinosaurs and other species at the end of the Cretaceous period (Leakey & Lewin, 1996). In this case though, species are being annihilated by the economic growth and over-consumption by man rather than natural disasters such as volcanoes and meteors.

There has been an accelerated decrease of species diversity, as well as cultural diversity, as modernization and global-

ization become more prominent goals for countries. In his article concerning conservation, David Orr states that “the causes of species decline include human population growth, economic expansion, pollution, climate change, mining, logging, urban sprawl, over harvest, and displacement of indigenous peoples” (Orr, 2003, 948). Globalization is a force that can’t be stopped, and the natural environment is suffering greatly. If there is a better understanding of what pushes species towards extinction in certain parts of the world, though, perhaps steps can be taken to prevent future declines.

Economic liberalism and globalization certainly seem to be the catalysts for increases in the extinction of species across the globe. Despite the fact that this is such a prominent issue, statistical correlations between ecosystems experiencing extinction and economic areas affected by growth and globalization have not been drawn. It can be seen that extinction rates are increasing every year. Whether or not this increase is due to globalization has yet really to be seen. The case for unregulated trade and economic expansion has been made well by those who are opposed to these ideals, showing that environmental standards are often thrown to the side for profits. However, before the full impact of the loss of biodiversity due to globalization can be realized, one must have a greater understanding of biodiversity and its impact upon the globe.

## BIODIVERSITY

Currently, there are a little over 1 million known animal species on our planet. However, many species are still unknown, and some estimates state that there are as many as 30 million species (many of these being microorganisms). Approximately 15,000 new species are discovered by science every year, often including completely new orders of life that are being found in remote areas such as deep-sea thermal vents (Glavin, 2006). This leaves room for a wide variety of diversity to exist, from single cell organisms to the blue whale, the largest known mammal.

Biologists classify diversity into three different types. These are alpha diversity, beta diversity, and gamma diversity. Alpha diversity refers to the number of species that exist within an ecological community. Beta diversity compares species within neighboring communities that differ in physical characteristics. The changes between mountain environments and the surrounding areas, and the species that exist in these areas, would be an example of this. The last measure, gamma diversity, includes ecological communities over a broader geographical range and can include areas that have similar habitats but are separated by many miles (Leakey & Lewin, 1996). While there is a large range of diversity that exists, these communities and biota all still interact with each other, having an effect on all that is around.

The Gaia hypothesis, proposed by James Lovelock in the 1979, looks at the interconnectedness of biota and the systems in which they live. This hypothesis proposes that all ecosystems on the planet are interdependent and work together as a whole. Some toss this theory to the side due to the fact that there are those who take it too far, treating all of Earth's biota as though they are one single organism. However, this is not the essence of the Gaia hypothesis. Rather, it is to point out that individual ecosystems are maintained through the species contained within them, and therefore the health of the overall environment comes from the interaction of its ecosystems (Ibid). This creates a different perspective concerning the importance of biodiversity. An entire system needs to be appreciated holistically rather than as just a part, as one component cannot thrive without the preservation of another. The ecosystem needs to continue to operate as a whole to be truly viable.

We live in a period of biodiversity that has been unmatched since the Cambrian explosion, which was a time of unprecedented evolutionary experimentation that became the basis for the rest of the history of life (Ibid). Nurturing environments exist across the world, allowing for the further diversification of species. Prosperous environments such as rainforests allow for species to specialize in certain characteristics and traits more than in other areas. This in turn eventually leads to the further creation of new species, adding to biological diversity even further.

One theory that analyzes this distinction between greater diversity in more nurturing environments is the latitudinal

species diversity gradient. Diversity has an unequal distribution, with species diversity being highest around the equator. Species diversity then diminishes as it moves towards higher latitudes. There is a stark contrast between the amounts of species in the United States as compared to the rainforests of Brazil, where a stunning amount of variation exists. Indeed, rainforests are so rich in biodiversity that they are home to more than half of the world's land surface species. However, this is not to say that other ecosystems should be discounted. Dry habitats have low diversity, but they contain species that are more prone to adaptation and can survive through harsher conditions than those in species rich environments (Ibid). Recent research has found that this latitudinal gradient can also be applied to marine environments, which were once thought to be relatively static. Life thrives in the ocean at different latitudes, bringing new concerns over mining and waste disposal operations to light. More in-depth analyses of the impact of actions that may harm the environment, such as mining, would be beneficial in marine areas that have higher species diversity closer to the equator. Too much disruption within any biological community can lead to dramatic consequences, including extinction.

Extinction is by no means new to the fossil record. Species have been evolving and going extinct for millions of years, with the average longevity of a species being 4 million years (Ibid). Typically, species are able to adapt to changing conditions and climates. Modification in a physical environment can even be a powerful tool in evolutionary change. However, if a species does not adapt to changes in the environment, extinction occurs. Additions to the fossil record over the years have made it easier to trace these patterns of evolution and extinction. This in turn allows for a general idea of what the natural, or background rate of extinction for a species should be. Recently, the background, extinction rate has been calculated at being an average of one species every four years (Ibid).

Life is a chaotic cycle, but a cycle nonetheless, and drastic changes to the system can lead to catastrophic losses and increases in extinction. Moderate extinctions have occurred in spasmodic convulsions and cycles for millions of years, sometimes leading to the extinction of 15 to 40% of species. However, there are a few rare events that are much larger. These extinctions, referred to as the Big Five, make up 65% of species going extinct in a relatively brief instant. The most drastic, that of the Late Permian, saw an estimated extinction of 95% of marine animal species. The first mass extinction occurred at the end of the Ordovician period (roughly 440 million years ago), followed by the Late Devonian (365 million years ago), the end-Permian (225 million years ago), the end-Triassic (210 million years ago) and ends with the most well-known extinction at the end of the Cretaceous period (65 million years ago) that saw the extinction of the dinosaurs (Ibid).

### THE RISE OF MAN AND THE SIXTH EXTINCTION

The rise of humanity has led to drastic changes in the way that evolutionary ecology functions. As stated before, it has been found that the background extinction rate throughout the fossil record is an average of one species every four years. However, since the emergence of humans, this rate has risen dramatically. There are estimates for the amount of species going extinct every year that are currently as high as 30,000 species. Extinction at this rate then would be 120,000 times higher than that of background (Ibid). This qualifies the current extinctions as being comparable with those of the Big Five extinctions that have happened in the past. However, this extinction is not due to drastic changes in global temperature, natural disasters, or meteor impacts. It is instead being caused by one of Earth's species itself: *Homo sapiens*.

The impact of humans could first be seen with the disappearance on megafauna from the North American continent during the Pleistocene. Large mammal species first began to disappear 13,000 years ago, and by 9,000 years ago species such as the mammoth and the saber-toothed tiger disappeared. Originally, these extinctions were thought to be due to drastic climate changes. However, recent research shows that the impact of humans due to over-hunting led to the demise of these creatures. Rapid ecosystem change was set into motion when a few large animals were exterminated by humans. Similarly, humans brought new species that led to further extinction as the addition of foreign species led to increased competition for habitat and resources (Glavin, 2006).

As humans spread throughout the world, extinction followed. This was seen most clearly when island environments, such as Australia, New Zealand, and the Polynesian islands, were inhabited. Australia saw the loss of most of its species weighing over 150 kilograms, including a flightless bird that stood almost as tall as a man. New Zealand saw the extinction of dozens of bird species as humans, and the rats that they brought with them, arrived 1,000 years ago. It is believed that as many as 2,000 species of birds went extinct as humans moved throughout the Polynesian islands, bringing with them chickens, small pigs, dogs, and of course, the rat. The destruction of natural habitat for taro fields and hunting further destroyed bird species (Ibid).

European colonization across the globe starting in the 17th Century left a new trail of destruction concerning the environment. Mans' view of nature had evolved (or devolved as some might say) from that of living in harmony to the belief that the natural environment was there to serve human purposes. This new focus upon exploiting the environment for economic gain led to unprecedented prosperity, but also unprecedented extinction rates. This increase in extinction rates has led many to say that we are currently in the next great mass extinction, or the Sixth Extinction, with this extinction being driven by economic growth and over-consumption (Leakey & Lewin, 1996).

Humans have adapted over the years just as other species. Nonetheless, much of our primitive, hunter-gatherer instincts have remained. The use of technology has given the appearance that our motivations and instincts have changed. However, this movement to a modern technological world has allowed us to lose sight of what is vital to our survival. Many are no longer directly involved with the production of the food that they consume, the clothes they wear, or the buildings that provide shelter. This change makes it difficult for natural and wild things to be valued. People have no connection to the resources themselves, just to the finished product that they get in the end.

### ECONOMIC LIBERALISM AND ITS DISCONTENTS

Habitat loss is considered to be one of the major factors of the current increase in the extinction of species. African nations have seen an average loss of 68%; Asian and Latin American nations have similar numbers (Whole Systems Foundation, 2004). Forest privatization in Brazil has led to rapid deforestation as owners try to make the most profits before future restrictions are imposed on cutting (Stiglitz, 2006). Macaws are numbering less than 300 in the forests of Brazil. Other species meeting similar fates across the world. Numbers are dropping due to the spread of timber operations and other economic practices that abuse the land, rather than using those that are more sustainable (Glavin, 2006).

There is little consideration of environmental impact. Instead the focus remains firmly on economic profits and short-term gains. Many environmental groups are opposed to unrestricted and unregulated free trade, which they see as undermining environmental laws in industrialized countries, which then promotes harmful practices worldwide. Institutions such as the World Trade Organization (WTO) have forced countries such as the United States to go against environmental regulations put in place concerning the protection of sea turtles. Several countries did not have these same protections as the United States, and the U.S. in turn blocked shrimp imports from these states. However, these countries filed complaints with the WTO, stating that the United States policies were discriminating against them and the U.S. lost the case. Similarly, in 1996, Brazil and Venezuela took the United States to the WTO and forced a change in policies concerning imported gas, saying that regulations under the Clean Air Act funded non-tariff barriers (Goldstein & Pevehouse, 2008).

Multinational corporations (MNCs) promoted by economic liberal ideals have also had negative impacts upon environmental regulations. Companies will often outsource to countries that have less strict environmental controls than those of their home countries. This brings profit into the host country though, and gives them less incentive to move towards polices that are more beneficial towards the environment. Corruption is a factor that cannot be overlooked in the case of MNCs, and the environment continues to suffer for

the economic gains of a relative few (Ibid). The impact of trade and investment liberalization on environmental regulation is especially apparent within the North American Free Trade Agreement (NAFTA). A more free flow of goods and capital results in subpar environmental laws and regulations, with governments weakening their environmental policies, inadequately enforcing current regulations, or refraining from introducing more stringent regulations in order to gain a profit (Blair, 2008).

Many international organizations such as the United Nations have started to realize the problem of these species disappearing, with the Food and Agricultural Organization of the United Nations stating that 20% of domestic animal breeds are at risk for extinction. This then leads to a decrease in what are called “genetic resources” that allow for a wider diversity of multipurpose animals. Globalization and economic liberalism have led to an increase in the specialization of specific agricultural animals, which in turn leads to a narrow genetic base that could be lacking in beneficial genetic factors (FAO, 2006). It has also been estimated that three-quarters of crop varieties have been lost over the past 20 years (Ibid).

Over-consumption has also led to an increase in acid rain through an increase in the emission of sulphur dioxide from energy production. Increases in acid rain have a dire effect on surrounding ecosystems. The depletion of rainforests for both timber and land use has reduced a major concentration of biomass, which is crucial for the creation of new species. Fresh water consumption has more than doubled to meet the demands of a growing population, while the availability of fresh water per capita greatly declined. Similarly, at least a quarter of the earth’s land surface is threatened by some degree of desertification due to the lack of water and the drive to use the land for maximum economic value (Scholte, 2006).

Demand can lead to dramatic decline in a species population when there are no regulations or controls. Fisheries in international waters, for example, are not owned by any state, making cooperation difficult. If states and MNCs refuse to cooperate, fish populations are diminished and all actors lose. Fisheries take the perspective that once one species is depleted they can move on to another variety. As of 2007 though, a third of the species had already been depleted due to over-fishing. Depletion occurs because boats and the MNCs that own them gain from larger catches. Therefore it is more profitable in the short run to have larger catches, even if it does lead to depleted stocks and eventual extinction. Problems such as this have been referred to as the Tragedy of the Commons, citing back to Britain’s problems with overgrazing (Hardin, 1968; Goldstein, Pevehouse, 2008).

In our world everything can be assigned a monetary value, and these values have transferred over to the environment and the maintenance of ecological zones. Economists and politicians demand to know what the value of land and

diversity may be, having the perspective that if it does not outweigh other economic gains that may come from development then it is not worth preserving. This has led to the development of the preservation of goods that are deemed to be profitable—crops that make the most money, animals that bring in the most revenue, and trees that bring in the largest gains being preserved. However, this may end up being a double edged sword. Species being preserved are those that are currently deemed the most economically viable. Economics shows the fickleness of human thought as demand constantly changes. What is economically viable now may not be so in a few years, and in that amount of time those species that would have met new demand may have been lost. The value of all species that exist cannot possibly be known, especially when new species are being discovered daily. Diversity needs to be valued for what it is and the potential that it may have, rather than for what it can produce right now.

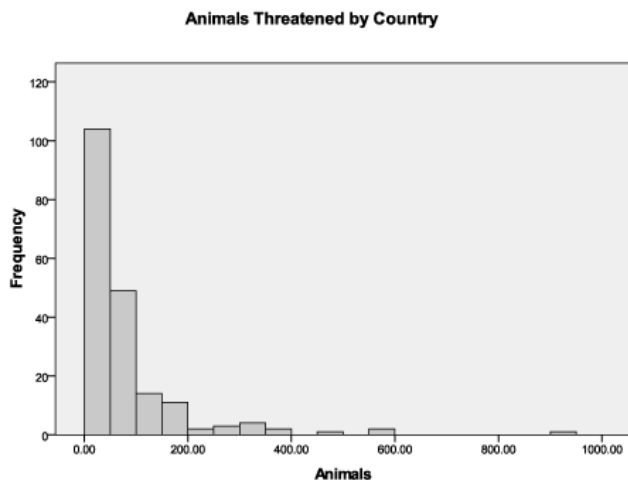
Recently in Indonesia this tendency to turn species into commodities has reached perverse degrees. Indonesia has proposed a program that would rent out some of its few remaining Sumatran tigers for around \$107,000 a year for a pair. Currently, there are less than 500 Sumatran tigers left in Indonesia, with most of the species’ natural habitat being destroyed by development and deforestation, even as the tigers continue to be hunted for traditional medicines. While there would be strict regulations concerning the living conditions of the animals enforced by the Indonesian government, several non-governmental organizations (NGOs) feel as though this avoids the true issues of habitat destruction and hunting (MSNBC, 2010).

Globalization has allowed for the world to be economically and politically connected in ways as never before. We have moved more towards a state of superterritoriality, with connections reaching across borders without the need of nation states to directly mediate these interactions (Scholte, 2005). However, this economic interaction has promoted the destruction of the environment for short-term profits and gains. This in turn has led to an increase in the amount of species going extinct, as has been previously discussed. While there has been a great amount of discussion concerning the disappearance of animal species, it is difficult to find data that provides a connection between globalization and extinction. Increases in the amount of species that go extinct each year can be found, but there is little statistical evidence that is connected back to what may be truly causing this extinction. Is it natural extinction or is it extinction occurring due to the destructive influence of humans?

#### CORRELATING GLOBALIZATION AND EXTINCTION

Large species of animals have already gone extinct due to human impact and the destruction of habitat. Demand for goods from consumers has led to over-hunting, over-fishing, and the introduction of non-native species throughout the world. Habitat loss is by far the greatest impact that man

has had upon the environment, destroying the relationships that exist between species (Goldstein & Pevehouse, 2008). It is difficult and perhaps impossible to predict what will happen when a species is removed from an ecosystem. However, it is important to keep in mind that there will be



an impact, whether it is minute or drastic.

Statistical analysis can be used to prove that globalization impacts animal extinctions. Two variables were selected: a globalization index and the amount of animals species threatened in a country. Threatened animal species are defined as those who are likely to become endangered in the future across part or all portions of its significant range. Threatened species data include “species that are categorized as either ‘critically endangered’, ‘endangered’, or ‘vulnerable’. Data include unconfirmed species occurrences and regionally extinct species, but exclude sub-species and introduced species” (EarthTrends, 2007). Classifications are set by the World Conservation Union (IUCN). Data was taken from the World Bank’s World Development Index and applies to 193 countries. The number of animal species threatened ranges from six to 937, with a range of 931 animal species. The average number of animal species threatened was around 82, although most countries have fewer than this.

Comparisons between the amount of animals threatened in a country and the degree of globalization in a country is done using the KOF Index of Globalization. This index was introduced in 2002 and covers the economic, social, and political dimensions of globalization. It defines globalization as “the process of creating networks of connections among actors at multi-continental distances, mediated through a variety of flows including people, information and ideas, capital and goods” (KOF Index of Globalization, 2009). It is conceptualized as a process that reaches across state borders and boundaries, bringing together economies, cultures, technologies, and governance that move all states towards interdependence (Ibid).

While there are three dimensions to this index, political globalization will be the main focus of this paper. This is char-

acterized by government policies and is measured by the number of embassies and high commissions in a country, the number of international organizations to which the country is a member, the number of United Nations peace missions in which the country has been active, and the number of treaties signed since 1945 (Ibid). The index itself is constructed by transforming each variable to an index on a scale from one to 100, with 100 being the maximum. The higher the value, the more politically globalized the country (Ibid). However, globalization is just one part of the equation. Industrialized countries as well as developing ones still have a large impact upon the environment by the amount of emissions that are produced every year. More globalized, industrial nations should in turn have higher emissions and, consequently, more threatened animal species.

Total CO<sub>2</sub> emissions including land use change can be defined as “the mass of carbon dioxide (CO<sub>2</sub>), a potent greenhouse gas, produced during the combustion of solid, liquid, and gaseous fuels, the manufacture of cement (CO<sub>2</sub> is produced as a byproduct as cement is calcined to produce calcium oxide), gas flaring, and land use change” (EarthTrends, 2007). Emissions from land use change take into account human-caused land-use changes such as deforestation and agricultural changes. The majority of CO<sub>2</sub> emissions come from burning fossil fuels; however, about a quarter of these emissions come from land-use change (Ibid). These emissions date back to the beginnings of industrialization in the middle of the 18th Century, but accelerated levels of emissions have been recorded during the latter half of the 20th Century (Scholte, 2005). Deforestation and other disruption of habitat included in these emissions have also seen a dramatic rise and are seen as being one of the leading causes of extinction in species across the globe, making the analysis of these emissions crucial to understanding the impact of man upon biodiversity.

Other variables must be taken into account in order to prove the relationship between globalization and the amount of animal species threatened in a country, as well as the relationship between CO<sub>2</sub> emissions as a measure of industrialization and the amount of species threatened. These variables will act as alternative explanations for changes in the number of species threatened. For the purposes of this paper, three control variables have been selected. These are the latitude of a country, whether or not a country was a former colony of a European nation, and GDP growth as an annual percentage. These variables take into account geological, historical, and economic factors that could be influencing a rise in the amount of animals being threatened across the globe.

Latitude was selected on the basis on the assumption that the latitudinal species diversity gradient holds true, and the further away from the equator a country is, the less diversity it will have. While initial analysis shows that there are countries such as Singapore and Colombia that have higher amounts of threatened animal species than others at higher latitudes, most do not experience this trend. There are many

countries at lower latitudes with low amounts of threatened species. Similarly, the United States, which is at higher latitudes, has the largest amount of threatened species with 937. Australia and China also fit into similar trends as the United States.

The variable of whether not a country was a former colony of a European nation looks at the historical, political, and economic conditions of a country. Some argue that industrialized countries of the North take advantage of the natural resources of the global South and outsource to these countries due to less stringent environmental regulations. Former colonies have struggled with developing into industrialized nations, often fighting what is referred to as “the resource curse” (Stiglitz, 2006). This struggle for development and deprivation of natural resources often then translates into land being decimated for economic growth, which causes the destruction of the habitats of thousands of species every year.

The last control variable selected, GDP growth as an annual percentage, takes into account further economic factors of a country. Countries with stronger economies, which can be represented by growth, tend to be more industrialized. Industrialization would in turn translate to further destruction of land and habitat. This would allow for higher amounts of threatened species in a country. However, it can be seen that countries such as Armenia and Equatorial Guinea have very high growth rates and low amounts of threatened species. Inversely, Uruguay and Guinea-Bissau have negative GDP growth rates and high amounts of threatened species. Similarly, the United States has a relatively low growth rate as a percentage of GDP, but has the highest amount of threatened species.

In order to test the dependent variable, independent

variable, and alternate hypotheses, a multi-variable linear regression analysis was performed. This regression shows the relative influence of several independent variables and can be applied to large bodies of information gathered by various means. Measurements of all variables have previously been described. The dependent variable is the number of species threatened in a country and the independent variables being a country’s index using KOF and the amount of CO<sub>2</sub> emissions that a country produces. Latitude, former European colony status, and GDP growth (as a percentage) were also used to strengthen the model and reduce error.

The above results show that there is a statistical correlation between the KOF political globalization index and the amount of threatened species in a country. This model has a low R<sup>2</sup> value, meaning that it has a weak relationship. The KOF political globalization index has a strong effect upon the amount of threatened species in a country, and fits within a 95% confidence interval for this model. Looking at the standardized betas further strengthens this relationship. The KOF political globalization index has a standardized beta of .476, meaning that it is the strongest coefficient in the model, and in turn has the strongest correlation to the dependent variable. Latitude has a standardized beta of -.308, making it the next strongest relationship. The other variables of whether or not a country was a former European colony and GDP growth have been shown to be statistically insignificant. High significance levels fall well outside of the 95% confidence interval and low standardized betas. This further strengthens this model’s relationship between globalization and the amount of animal species threatened, showing that the more politically

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.464 <sup>a</sup>	.215	.188	118.74038

a. Predictors: (Constant), gdp\_grow, Latitude, KOF\_political, Former\_colony

**ANOVA<sup>b</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	449119.273	4	112279.818	7.964	.000 <sup>a</sup>
	Residual	1635516.265	116	14099.278		
	Total	2084635.537	120			

a. Predictors: (Constant), gdp\_grow, Latitude, KOF\_political, Former\_colony  
b. Dependent Variable: Animals threatened

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-6.155	48.688		-.126	.900
	KOF_political	2.485	.485	.476	5.121	.000
	Latitude	-2.261	.839	-.308	-2.696	.008
	Former_colony	40.118	31.401	.142	1.278	.204
	gdp_grow	-.349	3.003	-.010	-.116	.908

a. Dependent Variable: Animals threatened

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.748 <sup>a</sup>	.560	.546	84.48794

a. Predictors: (Constant), gdp\_grow, Latitude, CO<sub>2</sub>\_emissions, Former\_colony

**ANOVA<sup>b</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1196963.177	4	299240.794	41.921	.000 <sup>a</sup>
	Residual	942244.006	132	7138.212		
	Total	2139207.182	136			

a. Predictors: (Constant), gdp\_grow, Latitude, CO<sub>2</sub>\_emissions, Former\_colony  
b. Dependent Variable: Animals

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	85.972	27.194		3.161	.002
	CO <sub>2</sub> _emissions	.000	.000	.736	12.668	.000
	Latitude	-1.086	.541	-.149	-2.006	.047
	Former_colony	23.534	20.451	.086	1.151	.252
	gdp_grow	-2.151	1.934	-.065	-1.112	.268

a. Dependent Variable: Animals

globalized a country is, the more threatened species it will have. However, the relationship between the industrialization of a country as measured through CO<sub>2</sub> emissions and animal species threatened must still be analyzed.

Accordingly, there is a strong statistical correlation between CO<sub>2</sub> emissions including land use change and the amount of threatened species that there are in a country. This model has an R<sup>2</sup> value of .560, indicating that it has moderately strong relationship. CO<sub>2</sub> emissions including land use change has a strong effect upon the amount of threatened species in a country, with a significance of less than .005, making it beyond the 95% confidence interval that is needed for statistical significance. Looking at the standardized betas further strengthens this relationship. CO<sub>2</sub> emissions has a standardized beta of .736, meaning that it is the strongest coefficient in the model, with the strongest correlation to the number of animals threatened in a country. Latitude, whether or not a country was a former European colony, and GDP growth have been shown to be statistically insignificant, with high significance levels that fall well outside of the 95% confidence interval and low standardized betas. This model for CO<sub>2</sub> emissions has been shown to have a more statistically significant effect upon the amount of animal species threatened, and is a stronger model than that correlation globalization and the amount of animal species threatened.

#### INSTITUTIONAL LIBERALISM AND ITS SOLUTIONS

We have begun to move towards a state of superterritoriality, with connections reaching across borders, and it has now been shown that globalization does have a part in the decrease of biodiversity. Environmental developments such as climate change, ozone depletion, and the loss of biodiversity also expand across borders and happen on a global scale. However, globalization in turn has increased our awareness of the bonds between humanity and the earth as a whole. Climate change, the loss of biodiversity, and ozone depletion affect us all. No nation is exempt to these changes (Scholte, 2005). Our perspective towards unregulated economic growth must change from that of short-term to long-term benefits.

While it seems as though the liberal economic ideals of free trade may have brought about the ecological disparities that we are faced with today, institutional liberal ideals of cooperation also seem to provide the best possibility of a solution, with countries working together for sustainability through different intergovernmental organizations. Environmental problems have encouraged international cooperation in recent years to combat problems such as acid rain, ozone depletion, whaling, global warming, and biodiversity loss (Jackson, Sorensen, 2007). Environmental effects are long term and are easily spread, creating a collective goods problem that must then have a collective solution. International cooperation is essential to preserving diversity, and intergovernmental organizations, intergovernmental

agreements, and non-governmental organizations provide forums for discussion to solve environmental issues.

The United Nations is one such IGO that provides grounds for discussion. The UN Environmental Program (UNEP) became more prominent in the 1990s as environmental issues raged throughout the world. The UNEP grapples with global environmental problems and provides technical assistance to member states, monitors environmental conditions, develops standards, and offers alternative energy resources (Goldstein, Pevehouse, 2008). The World Bank also has a growing interest in environmental protection, recently becoming involved with programs calling for reforms for the better protection of endangered animals such as the tiger, which is on the brink of extinction due to under-funded management programs (The World Bank, 2008).

International agreements have also played a large role in battling pollution and fighting for the preservation of biodiversity. Some 900 multilateral agreements have come about, dealing with climate change and biodiversity (Scholte, 2005). The Montreal Protocol, which was first signed by 22 countries in 1987 aimed to reduce chlorofluorocarbon emissions (CFCs) by 50% by 1998. This agreement saw expanded growth throughout the 1990s, as the evidence of ozone depletion due to CFCs mounted. By 1995, major industrial states had begun to phase out CFCs. Signatories also agreed to supply funds to Third World countries to pay for alternative refrigeration not based on CFCs to prevent the proliferation of free riders. This Protocol has been revised and strengthened multiple times over the years and is one of the most important successes of international cooperation to preserve the global environment (Goldstein, Pevehouse, 2008). The Convention on International Trade in Endangered Species (CITES) of Wild Fauna or Flora is another international agreement that has seen success. Established in the 1960s, CITES ensures that international trade in specimens of wild animals and plants does not threaten their survival. More than 5,000 species of animals and 28,000 species of plants are protected against over-exploitation through international trade by restricting what animals are available for imports and exports according to their status (CITES, 2009). Agreements such as this and the Montreal Protocol are critical in working towards an institutional liberal solution to the problem at hand and will play a large role in conservation in the years to come.

Incentive structures are also a key part in making institutional liberalism work for the economy as well as the environment. Unregulated growth has its appeals to those who are in search of short-term gains. However, the reigning perspective must become long-term. Everyone must recognize that we are all connected to the environment that is being destroyed for short-term gain. Some, such as Stiglitz, have proposed new global reserve systems that would go towards financing collective goods problems such as loss of habitat and biodiversity. This would encourage countries to move

more towards sustainable development, rather than quick, industrial development that is harmful to the environment (Stiglitz, 2006). Recently, developing countries such as the Group of 77 have also been asking for aid from more developed nations to aid in greener industrialization processes that would help to reduce CO<sub>2</sub> emissions across the world.

Many have also proposed solutions from strictly an economic perspective. The commodification of species places its value on its economic worth (e.g. plants for new medicines). It is more beneficial to have greater biodiversity of rainforest species in terms of medicines. Plant products account for 25% of pharmaceuticals that are currently used in Western medicine, and more are being discovered everyday. Alkaloid-rich plant species from Madagascar have proven to be cures for some types of leukemia and Hodgkin's disease. These plants save thousands of lives every year and net close to \$200 million in sales every year. Plants are proving themselves to be beneficial time and again, through both health benefits and economic gains. The U.S. pharmaceutical industry spends more than \$4 billion on the research and design of drugs a year. However, during this same time, the sale of drugs derived from natural plants made \$8 billion (Leakey, Lewin, 1996). This allows a dollar value to be attached to the value of a species, and gives economists and others in favor of exploitation a figure they can understand and grasp.

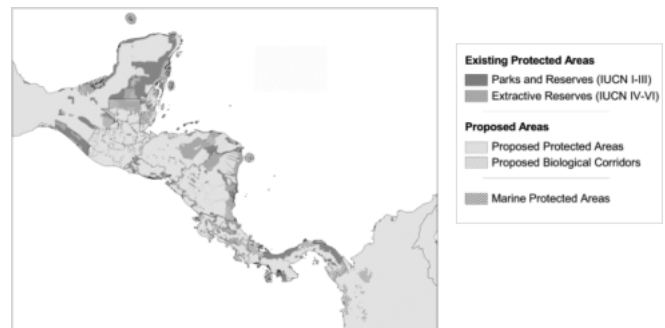
Commodification has its downside though. A dollar value represents only the exchange value of species diversity, rather than its place in an ecosystem. Similarly, protection for a species will only last as long as there is a demand for the product that it is producing. Species that could contain cures for AIDS and other diseases could become extinct before their value is discovered simply because they are not seen as being relevant at the time. The full cost of species can never truly be known. In 1970, for example, the Grassy Stunt devastated rice crops in Indonesia and India. Famine was only avoided by the development of a resistant strain, which was found in only one out the 6,273 varieties tested (Whole Systems Foundation, 2004). Commodification also tends to lead to a loss in genetic variance as aforementioned (FAO, 2006).

A new way of preserving a habitat, while still maintaining a profit, has been introduced in the form of ecotourism. Ecotourism is defined as "responsible travel to natural areas that conserves the environment and improves the well-being of local people" (TIES, 2009). Countries such as Mexico have set up areas where people can pay to enjoy nature in its undeveloped state through hiking, snorkeling, scuba diving, and other such activities. Costa Rica has become world-renowned through its rainforest eco-tourism, and various countries in Southeast Asia are now emerging as top ecotourism destinations. People are now able to profit by preserving the land, rather than destroying it.

Growing populations and rapid development have led to an unprecedented amount of human land use across the United States. The pressure to subdivide privately owned

land for residential development adds to the strain on habitat and takes away agricultural lands, stretches water resources, and affects biological diversity. The further development of lands close to those already preserved also adds management issues concerning invasive species and other resources (Wallace et al, 2008). However, there has also been a large increase in conservation easements over the past few decades, which has resulted in the preservation of millions of acres. Conservation easements are a critical to land trusts, and allow for private owners to still use their land while surrendering development rights. The donation of land or rights can also include significant tax benefits on income, estate, and property taxes, offering another economic solution to land preservation in the U.S. and elsewhere (Wilson, Johnston, 2009).

Biological corridors have also been introduced that look at protecting biodiversity further. These corridors link protected areas with green strips of vegetation running through neighboring rural lands, and can help provide species with the amount of space and movement they need to thrive.



The above map shows the proposed elements of the Mesoamerican Biological Corridor. This corridor was conceptualized in 1997 and was agreed upon by Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. The corridor includes rain and cloud forests, mangroves, and mountain ranges, and encompasses 40% of the territories combined. This is just a small portion of land relative to the world's surface, but it accounts for 7% of the world's biodiversity. Mexico has recently signed on to the partnership, adding to the legitimacy of the program and creating a unique system of regional environmental governance. The goals of this partnership are to preserve the habitat and unique biodiversity that exist in the region while increasing the quality of life of its inhabitants (EarthTrends, 2007).

History shows that the larger the habitat a species has, the more likely it is to prosper. However, current preservation programs confine animals to small areas, making them more prone to extinction. One example of this came with the heath hen in the early 20th Century. Heath hens were on the border of extinction due to habitat loss in 1908. Conservation efforts were put into effect and showed early signs of success. However, natural disaster struck a few years later completely decimating the population because they were



restricted to one location. The entire population was then extinct by 1932 (Leakey, Lewin, 1996). Diversification of habitat as well as a diversity of species is needed in order for an ecological environment to truly thrive. Some success with this has been found in the United States with the Endangered Species Act. Since enacted in 1973, it has been successful in providing habitat preservation for species on the verge of extinction such as the whooping crane, Kirtland's warbler, and bald eagles. These species have now begun to recover, with numbers increasing every year (Bean, 2005). The success of the program eventually leads to the delisting of endangered species, as was the case with the bald eagle and gray wolf.

As stated before, non-governmental organizations play a key role in cooperation for the preservation of a species. The World Wildlife Fund (WWF) plays an instrumental part in the preservation of species as well as their habitats. Recently, a strategy for action has been proposed for the preservation of tigers in the wild. This initiative for conservation focuses on geographical areas that will allow for the preservation of tigers which also benefits humans. Tigers have been pushed to the verge of extinction due to habitat loss, as well as being targeted for traditional medicines and their pelts. However, tigers are considered to be a keystone species for survival, a species that is essential to keeping a biotic system in balance. The WWF has set up several protected ecological zones that take into account the preservation of tigers as well as their prey. These zones help to provide economic incentives and jobs that make it profitable to keep the species alive and preserve its habitat. While the aim is for a long term conservation landscape, there is still a great amount of work to be done. Initial results show, however, that programs such as this are effective for the preservation and continuation of such a magnificent creature (WWF, 2002). In Thailand, the 2,500-square-mile Huai Kha Kheang and Thung Yai Wildlife Sanctuaries on the Myanmar border also show a rare success in the struggle to save the world's declining tiger population. This effort, funded by the Wildlife Conservation Society, has increased patrols that ward off poachers and has stabilized the tiger population in the region (Casey, 2010).

## CONCLUSION

"The worst thing that can happen—will happen—is not energy depletion, economic collapse, limited nuclear war, or conquest by a totalitarian government. As terrible as these catastrophes will be for us, they can be repaired within a few generations. The one process ongoing...that will take millions of years to correct, is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly our descendants are least likely to forgive us."

-E.O. Wilson, Harvard Magazine, 1980

Species extinctions have been rising at an unprecedented rate with the increase of globalization. Economic gains are undermining the simple beauty and value of biodiversity, placing an

emphasis on short-term profits instead. Millions of years of evolution have been disregarded for the simple notion that earth exists for material profit. Models have been used to statistically shown that globalization and CO<sub>2</sub> emissions have an impact on the animal species around them. This is only part of the process. Changes must take place in the system that allow for progress to be made in areas of environmental protection. Some have tried to do this by placing an economic value upon species and habitat. However, commodification can only be part of the solution, and will prove to be very costly if employed alone. Value also needs to be placed upon a species' worth to an ecological system seen as an organic whole.

While economic liberalism has created many of the environmental problems that exist today through unregulated fair trade, institutional liberalism offers some of the solutions through IGOs, NGOs, and other international agreements. Some success (as well as failures) have been found in these areas, especially in the cases of CITES and the Montreal Protocol. However, continued cooperation will be needed for us to prevent further degradation of the environment. No nation is exempt from CO<sub>2</sub> emissions and other environmental concerns that reach across borders. Nations need to work together for the reduction of pollution as well as the preservation of habitat that is so essential for biodiversity, and international institutions provide essential forums for cooperation.

Once species and diversity are lost, they can never be recovered. Our world consists of "endless forms most beautiful and most wonderful" (Leakey & Lewin, 1996), with each species having distinct characteristics and genetics that can be found nowhere else. We are intrinsically linked to the environment around us, and this is becoming more apparent as humanity becomes more connected to each other through globalization. It is the responsibility for all to realize that changes must happen before it is too late and those species that are such an essential part of our existence are gone.

## REFERENCES

- Bean, Michael J. (2005, May). The Endangered Species Act: Success or Failure? Retrieved May 1, 2009, from Environmental Defense Web site: [http://www.edf.org/documents/4465\\_ESA\\_Success%20or%20Failure.pdf](http://www.edf.org/documents/4465_ESA_Success%20or%20Failure.pdf).
- Blair, David J (2008, November, 01). Trade liberalisation, environmental regulation and the limits of reformism: the North American experience. *Environmental Politics*, 17, Retrieved February 18, 2009, from <http://search.ebscohost.com.tproxy01.lib.utah.edu/login.aspx?direct=true&db=8gh&AN=35020647&site=ehost-live>.
- Casey, Michael (2010, January, 23). "Save the tiger: Pressure mounts for tougher action." *AP News*. AP News, Web. 26 Jan 2010. [http://m.apnews.com/ap/db\\_21800/contentdetail.htm?contentguid=3gZPbW54](http://m.apnews.com/ap/db_21800/contentdetail.htm?contentguid=3gZPbW54).
- Glavin, Terry (2006). *The Sixth Extinction*. New York, NY: St. Martin's Press.
- Goldstein, J., & Pevehouse, J. (2008). *International Relations*. New York: Pearson Longman.

- Hardin, Garrett (1968). "Tragedy of the Commons." *Science* 162:1243-1248. Web. 6 Mar 2010. [www.sciencemag.org](http://www.sciencemag.org).
- Jackson, R., & Sorensen, G. (2007). *Introduction to International Relations*. New York: Oxford University Press.
- Leakey, R.; Lewin, R. (1996). *The Sixth Extinction: Patterns of Life and the Future of Humankind*. New York: Anchor Books.
- MSNBC (2010, Jan 26). "Rent-a-tiger idea met with scorn by some." *MSNBC.com*. MSNBC, Web. Retrieved Jan 26, 2010. <http://www.msnbc.msn.com/id/35061091>.
- Orr, David W (2003 August). Diversity. *Conservation Biology*, 17, Retrieved February 18, 2009, from <http://web.ebscohost.com.tproxy01.lib.utah.edu/ehost/pdf?vid=5&hid=106&sid=8fb54580-6a98-469a-a03d-88fd1ac97165%40sessionmgr112>.
- Scholte, Jan Aart (2005). *Globalization: A Critical Introduction*. New York: Palgrave Macmillan.
- Stiglitz, Joseph E. (2006). *Making Globalization Work*. New York, NY: W.W. Norton & Company.
- Wallace, George N, David M Theobald, Tawnya Ernst, and Katherine King (2008). "Assessing the Ecological and Social Benefits of Private." *Conservation Biology* 22.2:284-296. Retrieved 8 Oct 2009, from <http://www3.interscience.wiley.com/cgi-bin/fulltext/119406175/PDFSTART>.
- Wilson, Amy, and Megan Johnston (2003). "Legacy of the Land." *Money* 32.13:144-145. Retrieved 6 Oct 2009 from <http://web.ebscohost.com.tproxy01.lib.utah.edu/ehost/detail?vid=6&hid=7&sid=24a3929b-9cef-4b53-b352-b524438216d7%40sessionmgr11&bdata=JnNpdGU9ZWVvc3QtbG12ZQ%3d%3d#db=aph&AN=11491517#db=aph&AN=11491517>.
- (2009). Welcome to CITES. Retrieved February 18, 2009, from Convention on International Trade in Endangered Species of Wild Fauna or Flora Web site: <http://www.cites.org>.
- (2009). About TIES. Retrieved April 13, 2009, from The International Ecotourism Society Web site: [http://www.ecotourism.org/site/c.orLQKXPCLmF/b.4832143/k.BFC1/Welcme\\_to\\_TIES\\_Uniting\\_Conservation\\_Communities\\_and\\_Sustainable\\_Travel.htm](http://www.ecotourism.org/site/c.orLQKXPCLmF/b.4832143/k.BFC1/Welcme_to_TIES_Uniting_Conservation_Communities_and_Sustainable_Travel.htm)
- (2008). KOF Index of Globalization. Retrieved April 9, 2009, from KOF Index of Globalization Web site: <http://globalization.kof.ethz.ch/>
- (2008). Executive Summary. Retrieved February 2, 2009, from The World Bank Web site: <http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/Publications/448813-1212785337028/summarytiger2008.pdf>
- (2007). WDI On-line. Retrieved February 2, 2009, from The World Bank Group Web site: <http://ddpext.worldbank.org.tproxy01.lib.utah.edu/ext/DDPQQ/showReport.do?method=showReport>
- (2007). EarthTrends. Retrieved April 27, 2009, from World Resources Institute Web site: [http://earthtrends.wri.org/searchable\\_db/index.php?theme=5](http://earthtrends.wri.org/searchable_db/index.php?theme=5)
- (2006, December 15). 20 percent of animal breeds are at risk of extinction. *FAO Newsroom*, Retrieved February 2, 2009, from <http://www.fao.org/newsroom/en/news/2006/1000464/index.html>
- (2004, May 06). Diversity and Extinctions. Retrieved April 13, 2009, from Whole Systems Foundation Web site: <http://www.whole-systems.org/extinctions.html>
- (2002 February). Conserving Tigers in the Wild: A WWF Framework and Strategy for Action 2002 - 2010. Retrieved February 18, 2009, from World Wildlife Fund Web site: <http://www.world-wildlife.org/species/finder/tigers/WWFBinaryitem9365.pdf>