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Affluent Populations and Their Effect on Biological Diversity through the Consumption of Meat, Electronics, and Motor Vehicles

Melody Flores

Honors College, Pace University

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Affluent Populations and Their Effect on Biological Diversity through the Consumption of Meat, Electronics, and Motor Vehicles

Melody Flores

May 21, 2014

Major: Environmental Studies


Advisor: Professor Marley Bauce

Department: Environmental Studies

TO THE PACB UNIVERSITY PFORZHEIMER HONORS COLLEGE:

As thesis advisor for Melody Flares

I have read this paper and find it satisfactory.

 Marley Bawce
Thesis Advisor

May 9, 2014
Date

Well Done!

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Abstract

The human has caused a far greater impact on the planet's biodiversity than any other species in existence, due to the impact of population, affluence, and technology. This thesis will argue the importance of biological diversity and how affluent populations are reducing biodiversity through the consumption of meat, electronics, and motor vehicles. Aldo Leopold's "The Land Ethic" and Herman Daly's "The Impossibility Theorem", among others, create a rubric evaluating human activities and provide alternative views on economic impossibilities. Consumption is reviewed from an ecocentric perspective, a holistic outlook placing emphasis on the ecosystem. The reader will become cognizant of their impact through a presentation of these product's life cycles and its impacts. The literature review is complemented by a minor piece of social research in the form of a one-on-one interview with a Pace University economics professor.

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Chapter 1 – Introduction

“You do know you could find yourself charged with being a dominant species while under the influence of impulse-driven consumerism, don't you?”

— Terry Pratchett

Until college, I was completely ignorant of how my personal consumption patterns affect the natural environment. I learned it is possible to consume too many resources. I felt responsible to further explore the relationship between consumption and environmental degradation. And so I ask: What impact does my diet have on the environment? What happens to my cell phone when I throw it away? Does public transportation really benefit the environment? There are so many questions that we don't even think to ask ourselves, because living in the developed world has allowed us to be fully ignorant of the consequences of our actions. Many, if not most populations in developed countries, are unaware of the impact of their consumption. We don't see where our garbage is going; we don't know where our smartphone materials come from. But does it even matter to be aware of this information? Is it our responsibility to care about something that is intangible to us? Consumption related environmental impacts don't draw concern because the damage is too far away. Other occurrences that are too far away also include the earthquake in Haiti, the tsunami in Japan, the human rights movement in Darfur, and the movement to save the Amazon Rainforest in Brazil. Most of us will never visit all of these places in our entire lives, yet there are many institutions dedicated to these causes. Regardless of how far away the damage is occurring, I believe populations of developed countries must acknowledge their environmental impact and try to mitigate it.

The research in my thesis stems from my desire to educate. Having been ignorant of my personal environmental interactions (before, of course, declaring my Environmental Studies major), I now believe that education is the key to environmental literacy. A successful environmental education incorporates a variety of disciplines, which my thesis exemplifies by combining literary and methodological traditions of moral philosophy, microeconomics, cultural sociology, and environmental science to discuss how wealthy nations are negatively impacting the environment.

In modern society, there are multiple and heavily contested environmental issues, such as climate change, resource depletion, overpopulation, and energy usage. Environmentalists believe these issues are real and risky: climate change is undeniable; resources are limited and are rapidly depleting; the population is growing at an unsustainable rate; and fossil fuels contribute to severe air pollution. Non-environmentalists believe that there is insufficient scientific evidence to *prove* climate change; that technology will provide ample substitutes for resources; that it is an inalienable right to produce unlimited offspring; and that it is economically unfeasible to use alternative energy sources in lieu of fossil fuels. In order to better understand the non-environmentalist perspective that opposes the very philosophical foundation of my undergraduate major, I conducted an in-person, one-on-one interview with an Economics professor at my university; this professor has completely differing views from mine. Quotes from this interview will run throughout the following pages in order to give context to the opposing viewpoint. There is ample scientific evidence regarding increasing environmental destruction. Science denialism and ignorance are existing issues that prevent proper nature-culture relations; the interview is utilized in demonstration of these sentiments.

The greatest concern of mine – the concern that triggers this thesis and represents the primary focus of the pages to follow – is biological diversity (“biodiversity”) loss, meaning the loss of species of flora and fauna. All species, from the great blue whale to the cyanobacteria inhabiting the marine waters, make up the vast web of biodiversity. Part of natural ecosystemic processes is the endangerment and extinction of species. According to the Endangered Species Act, “the term ‘endangered species’ means any species which is in danger of extinction throughout all or a significant portion of its range” (U.S. Fish and Wildlife Service, 2013). The International Union for Conservation of Nature (IUCN) defines “a taxon is extinct when there is no reasonable doubt that the last individual has died” (IUCN, 1994).

To quote my interview subject: “If a species becomes extinct because of human activity, I’m not necessarily going to mourn that species because everyday species become extinct and everyday mutations arise, which are the foundation of new species. So that would happen without human intervention.” He is correct in that species extinction is naturally occurring, however the endangerment and extinction of species is occurring at an unnatural pace. According to Johan Rockström (2009), the rate of current extinction is unlike any have seen since the last global mass-extinction with extinction rates estimated at 100-1,000 times the natural rate of species loss. Endangerment and extinction of species is of such importance that international organizations such as the IUCN Red List and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) were created to document the conservation status of species, as well as to conserve (protect) these endangered organisms. These organizations have been created to address the very problem I confront in my thesis: the reduction of biological diversity.

The United Nations Environmental Programme estimates that 150-200 species become extinct every day, that's 54,750 species per year on the conservative end (UNEP, 2010). But is it of any importance whether these species become extinct at such an accelerated rate? I argue that it is. Humans are the only organisms on the planet that are rapidly killing off entire species. We cannot reinvent extinct species. Once they are gone, they are lost forever. Species recently lost due to human activities are the passenger pigeon, the golden toad, the Madeiran Large White butterfly, and the Tecopa pupfish.

Citizens in the developed world are, through their direct consumption patterns, contributing to biodiversity loss. Biological diversity is adversely affected by the consumption of meat, electronics, and motor vehicles from prosperous populations. These populations are unaware of their impact because the damage is out of sight or far away. Confrontation of these issues is inconvenient as it raises awareness of purchasing implications, placing responsibility on the consumer. The explicit point of this thesis is to demonstrate to urban consumers exactly how their purchasing habits affect all populations of organisms, from microorganisms to megafauna. Reviewing the environmental ethical theory of anthropocentrism and ecocentrism will give context for the evaluation of the relationship between over-consumptive individuals and biodiversity.

Chapter 2 – Environmental Ethical Theories

According to DesJardins, “environmental ethics assumes that moral norms can and do govern human behavior toward the natural world” (DesJardins, 1997). The valuation of nature is cultivated through expressed concern regarding the health of future human populations, *or* through the explicit desire to protect ecosystems for their own right, disregarding concern for humans altogether. It is necessary to define these different types of environmental ethical values. These value sets will create the rubric for how I will be evaluating excessive consumerism in affluent populations and its impact on biological diversity.

Instrumental value is what a thing can be used for; typically, a means to an end. I instrumentally value the laptop that I am typing this thesis on or the pen that transfers my ideas to paper. Instruments do not matter in themselves, only insofar that they allow you to achieve more important end results. Intrinsic value, on the other hand, is something with value derived independently from a valuer, usually an end in itself. Humans, for example, all have intrinsic value. According to William Frankena, intrinsic value can also be prescribed to “... life, consciousness, and activity; health and strength; pleasures and satisfactions of all or certain kinds; happiness...etc.” (Zimmerman, 2002). Using these terms we can now introduce two categories of environmental ethical thought governing the human relationship with nature: Anthropocentrism and Ecocentrism.

a. Anthropocentrism

Anthropocentrism is entirely human-centered. It places a strong emphasis on humans and assigns instrumental value to all non-human things. Even before the term was coined in the

1860s (Kortenkamp, 2001), values of this ethic existed, largely influenced by religion, as argued in Lynn White's 1967 paper titled "The Historical Roots of Our Ecological Crisis" (White, 1967). In his essay, White explains how biblical themes from Judeo-Christianity affected mankind's relationship with nature throughout history. The book of Genesis describes the story of creation illustrating mankind's dominance over nature. God created all elements of the natural world in approximately seven days, creating man last and as written, in his image. Even though God created all things, God allowed men to name all creatures, perpetuating this ideology of dominance. The interpretation of the first book of Moses supposes that all physical entities exist to serve mankind (White, 1967). In contrast to pagan animism, which identifies guardian spirits in nature and cultivates respect even in resource extraction, Christianity does not believe in spiritualism in nature and therefore allows for indifference when culling nature (White, 1967). It may not be coincidental that the more developed and affluent countries have deep religious ties to Judeo-Christianity, finding man superior to nature, as reflected in their egregious consumption.

Anthropocentrists view inflicting damage on the environment with indifference because they place value only on human beings. According to Andrew Brennan of Stanford University, there is both strong anthropocentrism and weak anthropocentrism (Brennan, 2002). Strong anthropocentrism attributes intrinsic value to humans only, whereas weak anthropocentrism attributes intrinsic value to humans more than non-humans, suggesting there is some value attributed to non-humans (Brennan, 2002). Another term for weak anthropocentrism is *shallow anthropocentrism*. This is a "light green ethic" showing concern for the environment only in the interest of humans. Everything that modern environmentalism has sought for, under the term "sustainability," has been for the continued propagation of the human species. Put another way,

“the overwhelming thrust of the ‘environmental’ movement is dedicated not to the interest of Nature, but to the security and sustainability of the advancement of the human enterprise” (Livingston 1994: 214; cited in Curry 2011: 66-67).

Concepts such as sustainable development, resource management, and conservation fall under the category of Anthropocentrism. Gifford Pinchot, an American forester, was a staunch advocate of the theory, being the first real voice of the conservation movement. Through proper sustainable use of forests, Pinchot believed in “practical forestry” in which he “favored opening all ... reserves to carefully managed economic development” (Nash, 2001). The careful management of forests was not to benefit nature but to benefit future generations so that they may have equal access to the forest’s resources. In addition to his advocacy of proper forest management, Pinchot provided relentless support for the conservationists during the divide over the infamous Hetch Hetchy Valley. In the early 1990s, the Hetch Hetchy Valley, located in Yosemite National Park, was seen as an optimal water resource for the citizens of San Francisco who were facing a chronic fresh-water shortage (Nash, 2001). There was conflict between preservationists, notably John Muir, who argued for Hetch Hetchy Valley to be left alone due to its intrinsic value. Conversely, conservationists, such as Pinchot, believed in carefully managing and damming the valley for the citizens of San Francisco. Pinchot was a utilitarian, someone who believes in the greatest good for the greatest number. His views are exemplified by this statement: “the fundamental principle of the whole conservation policy is that of use, to take every part of the land and its resources and put it to that use in which it will serve the most people” (Nash, 2001).

Pinchot’s utilitarian views benefitted the human species, his values continuing into the 21st century. Curry identifies an additional reason for anthropocentrists to sustain the

environment: Nature provides humans, not only with resources, but it can meet our aesthetic and spiritual needs (Curry, 2011). If anthropocentrists focused on sustainability and conservation for the benefit of humans, the environment would be improved. Even so, environmentalists do not believe anthropocentrism is sufficient for significant progress, and its focus, as mentioned, is not on nature.

b. Ecocentrism

However, Anthropocentrism is not the exclusive theoretical concern housed within the larger environmental ethics, and there exist other fields of thought that attempt to move beyond a purely human-focused perspective. Ecocentrism is an encompassing ethic that values nature inherently. In contrast to anthropocentrism, ecocentrism attributes value to the ecosystem as a whole. It is a holistic approach finding inherent value in the interconnectedness between abiotic and biotic elements. It's an important ethic considering ecosystem stability is reliant on the symbiotic relationships between organisms.

Three philosophers have developed the ecocentric theory: Henry David Thoreau (1842), John Muir (2001), and Aldo Leopold (1981). In the mid-1800s, Thoreau picked up and moved to the woods just outside Concord, Massachusetts. Moving there to live a “deliberate life”, Thoreau also wanted to find the value of wilderness (Nash, 2001). In the couple of years he spent at Walden, Thoreau planted the seed of ecocentric thought by recognizing the importance of ecosystem processes:

Nature has her russet hues as well as green—Indeed our eye splits on every object, and we can as well take one path as the other—If I consider its history it is old—if its destiny it is new—I may see a part of an object or the whole—I will not be imposed on and think nature is old, because the

season is advanced I will study the botany of the mosses and fungi on the decayed—and remember that decayed wood is not old, but has just begun to be what it is. I need not think of the pine almond or the acorn and sapling when I meet the fallen pine or oak—more than of the generations of pines and oaks which have fed the young tree. (Thoreau 1842; cited in McKibben 2008: 4)

This is a remarkably advanced statement for Thoreau's time. His words cultivate an appreciation for the way nature operates. Typically, one would look upon decaying wood as rotted and useless, an eyesore. However, Thoreau points out that decayed wood is not old but will have a continued function in its ecosystem by becoming the source of nutrition for fungi and the apparatus through which moss grows. In a lecture he gave to the Concord Lyceum, Thoreau powerfully stated, "in Wilderness is the preservation of the World" (Nash, 2001). His values regarding nature heavily influenced one of the most famous preservationists in history, John Muir.

Muir was a man wholly unafraid of wilderness and advocated intensely for its preservation. He understood the value of nature at a young age and developed ideas similar to Thoreau regarding the interconnectedness of life. As a non-anthropocentrist, Muir was able to see himself as part of the ecosystem. This attitude is important because it fosters respect for the environment. Muir contrasts the hubris of man with ecocentric thought in a passage compiled by Nash:

Muir also valued wilderness as an environment in which the totality of creation existed in undisturbed harmony. Civilization, he felt, had distorted man's sense of his relationship to other living things. Modern man asks 'what are rattlesnakes good for?' with the implication that for their existence to be justified they had to benefit human beings. For Muir, snakes were 'good for

themselves, and we need not begrudge them their share of life.’ Elsewhere he declared that ‘the universe would be incomplete with man; but it would also be incomplete without the smallest transmicroscopic creature that dwells beyond our conceitful eyes and knowledge.’ (Nash, 2001: 128-129)

Muir is discounting an anthropocentric view in acknowledging the rattlesnake’s right to existence; this displays a profound understanding of ecology. He also demonstrates understanding by mentioning the ubiquitous microorganisms that are integral to the stability of the Earth’s most important processes, such as in the nitrogen and carbon cycles. However, these thoughts would not come to full fruition until the mid-1950s.

Aldo Leopold, known to be the most influential figure in the development of ecocentric environmental ethics (DesJardins, 1997), proposed the extension of our ethical consideration to the land. He recognized that ethics has evolved from the individual to society, and from human to human, noting that the next course would be the acquirement of ethics from human to land (Leopold, 1987). Leopold’s unique view saw the land as an organism, which had the ability to become sick and to become healthy (Leopold, 1987). Ultimately, the realization of an ecocentric environmental ethic was incredibly important because it viewed land in ecosystemic terms, whereas anthropocentrism does not consider the relationship between organisms at all. According to Leopold, the extension of ethics “simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land” (Leopold, 1987). It is necessary to extend ethics because there is insufficient knowledge, even from ecologists and environmental biologists, on the exact intricacies of every symbiotic relationship on the planet. By applying the precautionary principle, it allows us to preserve the biota, rather than exploiting it and later realizing that our impact was not only significant, but also irreversible.

In order for the land ethic to be applicable, Leopold mandates an “ecological conscience”. A conscience allows humans to have a sense of responsibility and obligation (Leopold, 1987). The conscience is why anthropocentrists believe in humans as a superior species to all other species. If humans are superior, then we have a moral obligation to preserve the land. Of all species, we are the only ones consciously aware of our destruction of the environment. The rational being, according to Leopold’s concept of an “ecological conscience”, would then try to remedy their impact or significantly reduce it. As a result of this “conscience” man is placed “as a citizen of the land community” (Curry, 2011).

Within conservation there is fear of a system that tries to economize everything (Leopold, 1987). Not all nature can be used for the benefit of humans but that does not mean it has no value. For this reason, my thesis will be guided by an ecocentric ethic, applying a holistic focus on ecosystems, recognizing their inherent value. Biodiversity, which is present in healthy ecosystems, is necessary to preserve. As mentioned, ecologists and environmental biologists are lacking in full knowledge of complex inter-organismal interactions, so how is it possible that we can cut down, pollute, erode and exploit nature? In order to address these impactful activities, the source of harm must be addressed.

Chapter 3 – The “Affluenza” Epidemic

In 1971, Paul Ehrlich and John Holdren (Ehrlich and Holdren, 1971) theorized that an increase of population places pressure on natural resources such as food, fiber, and metals and is the leading cause of environmental degradation. American biologist, Barry Commoner, argued that environmental impact was a product of “technological factors” (Commoner, 1972). Out of their infamous debate, regarding the most important causes of environmental impact, came the IPAT equation. IPAT, used as $I = P \times A \times T$, shows that environmental impact (I) is a product of population (P), affluence (A), and technology (T) (Chertow, 2001). Affluence is the state of having excessive wealth and material goods. Excessive will be defined as overconsumption, in that resource extraction and usage has outpaced the planet’s ability to replenish its natural resources. Chertow refers to affluence as economic growth, which can be readily measured by a country’s GDP (Gross Domestic Product) (Chertow, 2001). To show contrast in affluence, the U.S. has a population of 316,438,601 (CIA, 2013) with a GDP of \$16.72 trillion (CIA, 2013). In comparison, India, despite a significantly larger population of 1,220,800,359 (CIA, 2013) has a GDP of only \$1.758 trillion (CIA, 2013). Developed nations such as the USA, Australia, England, and Canada, among others, are categorized as affluent countries. India and China, countries with significant populations, are rapidly becoming developed and are major players in the consumption of natural resources (Myers and Kent, 2003). An increased rate of consumption increases environmental impact.

Population is a substantial part of the equation. The first to recognize that humans are able to overproduce was political economist Thomas Malthus (University of California Museum of Paleontology, 1995). In 1798, Malthus’ research was published in “An Essay on the Principle

of Population” (Malthus, 1798). His theory of population recognizes human’s exponential growth in comparison to the production of food, which grows at an arithmetic rate (Association of American Geographers, 2011). This is important because he explains that if left unregulated, the human population would surpass its ability to sustain itself. Food resources would become scarce and humanity would be thrown into a global famine (University of California Museum of Paleontology, 1995). According to this logic, it is completely rational to broaden food scarcity to all limited resources: freshwater, coal, oil, natural gas, metals, etc. In order to avoid global catastrophes (i.e. famine), Malthus suggests population control in the form of abstinence and criminal punishment for those who have children they cannot support (Malthus, 1798). Free access to birth control and education for women would also aid in population control. The greater the population of a country the greater their resource consumption is. Both population and affluence need to be mitigated in order to remedy damage to biological diversity.

Due to the exorbitant amount of consumption, which in turn negatively impacts the planet’s ecosystems (documented in chapters 6, 7, and 8); affluence has been occasionally termed “affluenza.” *Affluenza*, a documentary made in 1997, provides a definition of the phenomenon, “an unhappy condition of overload, debt, anxiety, and waste resulting from the dogged pursuit of more” (*Affluenza*, 1997). A disease-like condition, affluenza has been passively established as a model for success in developed countries, specifically in the USA. Since the end of World War II, technology and innovation has flourished, improving our lives with inventions including computers, cell phones, advanced motorized vehicles, the mechanized process of meat production, and more. The USA is known as a nation of consumers, consuming more product than its population’s fair share. In terms of fossil fuel energy alone, the Worldwatch Institute notes that the U.S. has “less than 5% of the global population ... [yet uses]

... 25% of the coal, 26% of the oil, and 27% of the world's natural gas" (Worldwatch Institute, 2013).

The documentary points out that "by 1987 there were more shopping malls than high schools in America" (*Affluenza*, 1997). The consumerist lifestyle is instilled from childhood with constant advertising on billboards, bus stops, subways, magazines, and the Internet. The disease of consumption is disruptive to the connections we have to other people and equally, if not more so, disruptive to the environment. However, my interviewee disagrees believing that increased consumption brings awareness to environmental degradation, "every evidences that increase consumption creates attention to cleaning up the environment so we can enjoy that consumption now that we've reached a greater level of baseline existence for the average person." My views are conflicting because I believe consumption related activities of industrialized nations create environmental degradation in the developing world.

For example, the biocapacity of the USA is recorded at 4.5-5.5 global hectares per capita since 1961. However, the USA's ecological footprint ranges from 6.5-9 global hectares per capita, significantly more than what the nation is capable of producing for its inhabitants (Global Footprint Network, 2012). In comparison, Mozambique, located in Africa, has distinctly decreasing biocapacity, recorded at 6.3 global hectares per capita in 1961 and has decreased to 2.5 global hectares per capita in 2009 (Global Footprint Network, 2012). This significant decrease can be explained by mining activities from countries such as Australia, India, and Brazil (Dhliwayo, 2012). Developed nations are taking advantage of developing nations by exploiting their resources, causing habitat loss through mining activities (discussed in further detail in chapter 7). Incidentally, even with the rapid decrease of their biocapacity, Mozambique's

ecological footprint has only been at 1 global hectare per capita since 1961 (Global Footprint Network, 2012).

As a citizen in the Western Hemisphere, it is nearly impossible to tread lightly on the planet, specifically as a member of the U.S. The website for an Ecological Footprint provided by the Center for Sustainable Economy (CSE, n.d.) tests for the following footprints: carbon, food, housing, and goods and services (CSE, n.d.). According to the CSE, the average U.S. citizen consumes the following in global acres: 91.4 (carbon footprint), 65.7 (food footprint), 31.6 (housing footprint), and 57.7 (goods and services footprint). In order to compare my footprint, I inputted personal information, which the CSE tabulated resulting in the following data in global acres: 39.4 (carbon footprint), 19.0 (food footprint), 20.3 (housing footprint), and 4.0 (goods and services footprint). The comparison is pictured in **Table 3.1**. The results are significantly different and my footprint is indeed greatly lower than the average U.S. citizen. I am able to achieve these results because I try to live my life in an environmentally friendly manner. I am a vegetarian, only buy items when they become worn out (I possess an archaic phone, but it still works! **Update:** Since beginning my thesis my archaic phone broke and the only phone available

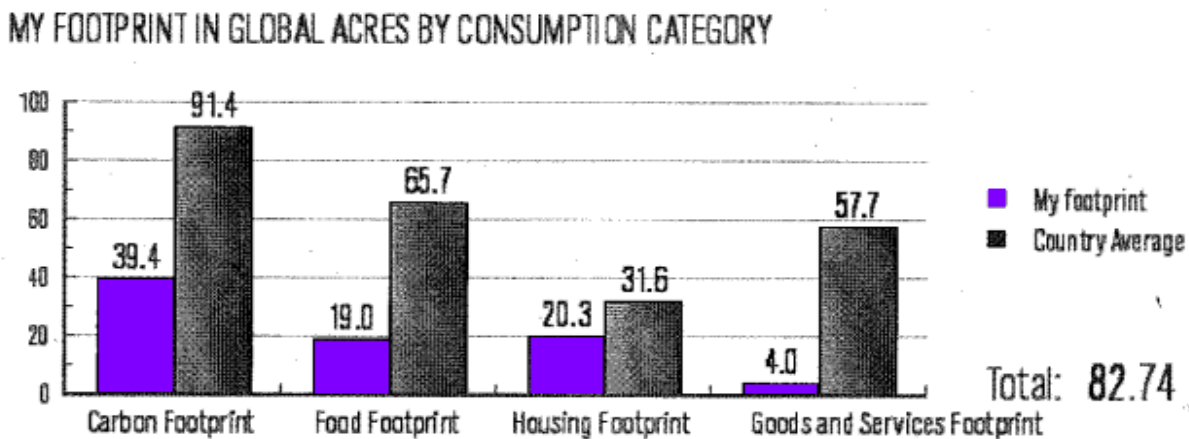


Table 3.1 My footprint in global acres by consumption category.
Source: CSE, n.d.

at the local Radio Shack was a smartphone.), take public transportation almost anywhere I go, reduce waste by using a reusable water bottle and reusable containers for food, cook at home, rarely buy new clothing, and unplug all electronic devices when not in use. I also participate in a number of other environmental practices. However, the test results say, “if everyone on the planet lived my lifestyle, we would need 2.13 Earths” (CSE, n.d.). Even with all the careful measures I take to reduce my impact on the planet, there are unavoidable impacts I cause just by living in the affluent country of the United States. Overall, affluent populations are over-consuming resources, posing harm to ecosystems. The definition and importance of biodiversity will be provided in order to properly assess the impact consumerism has on it.

Chapter 4 – Biological Diversity: Why does it Matter?

An affluent lifestyle requires non-renewable resources such as oil, coal, and natural gas. Impacts of consumption are extremely profound and include the impact of waste from products, as well as impacts from the production process. It also requires the use of many resources that when grown or extracted pose a serious threat to future generations, but more importantly to biological diversity. Biodiversity is the variety of life in a particular region (California Biodiversity Council, 2008). It includes all forms of life including plants, animals, fungi, bacteria, etc. Biodiversity can be studied at any level of life including the species, population, community, or ecosystem level. Species of all sorts from single-celled organisms to the most complex eukaryotic multicellular organisms interact to form symbiotic relationships. Symbiosis involves mutualistic, parasitic, and commensal relationships between two or more organisms of different species. When scientists use the term “web of life,” they mean that all life is interconnected and dependent on each other. These relationships are at the core of biodiversity.

a. The Utility Value of Biodiversity

Biodiversity is important for reasons both pertaining to humans and to the natural system. Humans value biodiversity from an aesthetic perspective. The beauty of nature resonates with every individual and at the core of the human soul there is a reverence for intimidating majestic sceneries. Biodiversity also provides a variety of foods ranging from the simple apple to the malodorous yet delectable Durian. The utility value of biodiversity is high due to the range of goods and services humans receive from it in terms of natural resources. Various forms of life and ecosystems such as mangroves, marshes, swamps, and coral reefs, work as natural barriers in aiding in storm protection (Staudinger *et al.*, 2012). In addition, plant and wildlife diversity is of

utmost importance in the medical field because it helps in the discovery of cures against diseases and pathogens (National Wildlife Federation, n.d.).

Reasons of importance regarding the greater ecosystem are significant and necessary for continued human life, as well as non-human life. The umbrella reasoning is that biodiversity stabilizes ecosystem processes. The structure and functioning of the greater ecosystem is dependent upon a multitude of cycles, without which would make life on Earth impossible. The major cycles include the biogeochemical (inorganic nutrients) cycle, water cycle, carbon cycle, oxygen cycle, nitrogen cycle, and phosphorous cycle (McShaffrey, 2008). Each of these cycles contains an organic or inorganic compound that circulates the ecosystem in a process similar to recycling. Also within these cycles biotic and abiotic elements interact to transfer energy around the ecosystem. For example, in the phosphorous cycle participants include rocks, seawater, fungal microorganisms, plants, and mammals (McShaffrey, 2008). There is much biological diversity and complexity in just that one process.

b. Adjusting to Disturbances

Certain natural processes that do much damage include disease and natural disasters. Not always seen as beneficial from a human perspective, these events are absorbed by ecosystems rich in biodiversity. Organisms living in a community with a great genetic diversity are less susceptible to disease than an area where organisms greatly resemble one another. Disease is easily transferred in populations that are homogenous; a popular example is seen in the agricultural field with monocultures (King and Lively, 2012). Due to decreased genetic diversity, pathogens are easily able to transmit from organism to organism with ease. Technology is typically used to relieve such issues, as advocated by my interview subject, “technology is not a

bad thing; it's something that should be embraced, embraced to the extent that it carries progress forward." Yet, in this case technology has accommodated the development of viruses and diseases. Insecticides and antibiotics, used to reduce pests and diseases, has defeated its purpose as there are now repellant strains of organisms that developed through evolution in response to these toxins (Furuya and Lowy, 2006). Only a community rich in biodiversity can adequately combat resistant strains of harmful organisms.

Yet another characteristic of biodiversity is its ability to adjust to disturbances. Events such as volcanic eruptions, forest fires, devastating tornadoes, floods or hurricanes severely damage the environment and have the possibility to wipe out all life in the area. Volcanic eruptions are the most severe of the disasters listed and can not only wipe out pre-existing life but can also be the source of new life. In the case of a volcanic eruption, all life in the immediate vicinity (with the exception of thermophiles [heat-loving bacteria]) is wiped out and any life that begins to grow is a result from primary succession. According to Marietta.edu, primary succession follows from "rock, lichen, moss, grass, shrub, trees, [to] oak hickory forest" (Marietta College, 2013). On the other hand, secondary succession occurs when a natural disturbance reduces the population of an ecosystem, yet ample life grows back. Secondary succession contributes to biodiversity; for example, an organism that cannot reproduce without the intense heat of a forest fire is the *Pinus Banksiana* (jack pine) (Herring, 1999). Its cones need the heat in order to open and release their seed. In the case, especially, of secondary succession, a high amount of biodiversity is essential for the ecosystem to withstand these disturbances.

c. Biodiversity in Expected and Unexpected Places

As evidenced, biodiversity is extremely important and plays a role all over the planet, however higher rates of biodiversity are concentrated within the tropical rainforests (National Wildlife Federation, n.d.). Rainforests house two thirds of all the planets' species (NESCent, 2013) in an area that only covers 6% of the land's surface (Rainforest Conservation Fund, 2014). With the amount of species present in this biome, it isn't surprising that scientists haven't come close to classifying these organisms according to their phylogeny. Even though the highest concentration of biodiversity is located near the equator, there are many unexpected places that one may find biodiversity. Rainforests are the most obvious example but if one were to sample and observe pond water under a microscope there would be an uncountable amount of microorganisms. In taxonomical classification of life there are three domains: Bacteria, Archaea, and Eukarya. *Homo sapiens* are part of Eukarya in Phylum Chordata under the Kingdom Animalia. Organisms in pond water can be found across all domains of life. One may find bacteria, amoebas, worms, algae, insect larvae, etc. (Van Egmond, 2004).

d. Direct Loss of Biodiversity

Unfortunately, the planet's biodiversity is threatened from human activities. It is important to note that species extinction, and therefore biodiversity loss, is a natural occurrence, however it is being accelerated at a rate that "has not been seen since the last global mass extinction event" (Rockström, 2009). Loss of biodiversity occurs directly and indirectly. Direct factors include deforestation, overexploitation, and hunting, whereas indirect factors stem from pollution and global climate change. Deforestation is a process that occurs when land is cleared for the purpose of agriculture, meat production, or timber extraction. Forests are being bulldozed

all over the world for the production of commodities, especially in Brazil, Canada, the United States, Indonesia, China, Russia and the Democratic Republic of Congo in Africa (World Preservation Foundation, 2010). The rainforests, mentioned as biomes with the greatest biodiversity, suffer greatly from deforestation. According to National Geographic, “during the past 40 years, close to 20 percent of the Amazon rainforest has been cut down—more than in all the previous 450 years since European colonization began” (Wallace, 2007). This is a significant amount of deforestation and its effects on biodiversity are profound. Deforestation leads to habitat loss and habitat fragmentation, which can cause species to die out. Many stationary species do not have the means to avoid being cut down. Mobile species may not be able to find new habitats because preceding species may already occupy their niches; additionally competition for limited resources is increased.

Evidently, these same effects are present in overexploitation. Overexploitation occurs when a resource is extracted at such an accelerated pace that the natural ecosystem is unable to replenish them in accordance with the extraction rates. Overexploitation is usually associated with products such as fish, metals, oil, coal, trees, etc. For example, fish used to be abundant in the ocean; however, of the large ocean fish that still exist, their population is only at 10% compared to their pre-Industrial populations (National Geographic, n.d.). It’s hard to believe there is scarcity in fish populations considering the ocean covers 71% of the planet (NOAA, n.d.). When extracting resources such as oil, coal, or metals, it disrupts the habitat of animals, plants, bacteria, and typically all forms of biotic and abiotic elements. This creates stress on that ecosystem to recuperate, which it sometimes cannot. Deforestation and overexploitation have similar damaging impacts on biodiversity through habitat loss and fragmentation.

Another direct impact is hunting. Even though not everyone hunts, hunting still contributes to biodiversity loss. Species such as the dodo, the Tasmanian tiger, and the passenger pigeon, among many others, have been hunted to extinction (Nelson, n.d.). Commercial hunting is threatening species, especially the mega fauna in Africa. Just recently, the western black rhino became extinct, while soon to follow may be Africa's northern white rhino and Asia's Javan rhino (Knight, 2013). The reduction of species diversity on the planet is a direct sign of biodiversity loss.

e. Indirect Loss of Biodiversity

Indirect forms of biodiversity loss arise from pollution and climate change. Pollution, a byproduct of consumption, occurs in a variety of forms. Air pollution results from burning coal for energy and can also be emitted from planes and cars in the form of carbon dioxide. The sulfur dioxide emitted from the smoke stacks of coal power plants aids in the creation of acid rain. When acid rain falls into bodies of water, it lowers the pH making the environment more acidic. The acidity of the rain releases aluminum in soils, which when combined with the acidity of the contaminated water becomes extremely toxic to certain species of fish, killing them (EPA, 2012).

Water pollution also significantly diminishes biological diversity through the reduction of marine species. For example, one form of water pollution develops from nutrients in fertilizer, such as nitrogen and phosphorous. These nutrients are transported to water systems, and eventually to greater bodies of water, due to runoff. Urbanization has increased runoff because there are more paved roads and less area where rain can be absorbed. As a result, rain gathers these nutrients and carries them to bodies of water where eutrophication occurs (Slingenberg *et al.*, 2009). In the process of eutrophication, microorganisms feed off nitrogen and phosphorous

leading to dense blooms. The microorganisms take up oxygen in the water and so fish and other forms of marine life can no longer live there because of the anoxic conditions. The death and or displacement of a species are an indication of biodiversity loss.

Global climate change is a significant contributor to biodiversity loss. Climate change is occurring due to the enhanced greenhouse effect. The greenhouse effect is necessary to keep the planet warm and our oceans liquefied, without it the Earth would be uninhabitable. The greenhouse effect essentially traps carbon dioxide in the atmosphere, whereas the *enhanced* greenhouse effect is a result of too much carbon dioxide. Carbon dioxide is being released from activities such as deforestation, animal agriculture, transportation, and energy consumption. In deforestation, organisms that are sinks for carbon dioxide, such as plants and trees, typically photosynthetic organisms, release CO₂ when dead. Because of the extent deforestation is occurring, the CO₂ released from plants and trees are detrimental.

Animal agriculture is one of the greatest offenders of greenhouse gas (GHG) emissions, producing 56% of non-CO₂ emissions and 19-29% of total greenhouse gas emissions (CGIAR, n.d.). Ruminants produce methane during flatulence which nature could normally absorb without harm. However, due to the sheer amount of ruminants being raised for meat production, their combined numbers are able to produce enough methane that it becomes a problem and a significant contributor to climate change. It matters especially since methane has 21 times the global warming potential than CO₂ does within 100 years (United Nations, 2014).

The second to largest sector responsible for GHG emissions is transportation with 28% of emissions (EPA, 2011). Both planes and automobiles transport the majority of affluent populations across their respective countries and across the globe. Both are expensive modes of travel and are significant contributors to GHG emissions. Aircrafts contribute a considerable

amount of GHG's into the atmosphere; most notable are CO₂ and NO_x. NO_x is composed of nitrous oxide and nitrous dioxide, when combined creates the compound ozone. Ozone contributes to depletion of the ozone layer, as well as to pollution in the troposphere. The IPCC reported that in 1990, emissions of CO₂ and NO_x from an aircraft accounted for 2% each of the total world CO₂ and NO_x emissions (IPCC, 1990).

Automobiles are also offenders releasing “1.5 billion metric tons of greenhouse gases into the atmosphere each year” (U.S. Department of Energy, 2013). The emissions from animal agriculture and transportation are able to influence climate change rates and pose serious threats to biodiversity. Species may attempt to adapt to the dramatic shifts in temperature by migrating poleward, however other devastating human activities may halt it. Migration is halted as a consequence of construction or prevented by highly developed areas. Habitat fragmentation is a legitimate concern that can dwindle the number of species, potentially leading to extinction (The Nature Trust of British Columbia, 2012).

The electricity sector is responsible for 33% of all U.S. greenhouse gas emissions (EPA, 2011), contributing 5,490,631 million metric tons of CO₂ in 2011 alone (U.S. Energy Information Administration, 2011). Energy derived in the form of coal and petroleum, among others, harm biodiversity through their extraction processes, leading to habitat loss. However, they contribute to climate change when coal is burned and during the combustion of petroleum. The biodiversity that is affected results in the same losses that have been discussed from the effects of transportation emissions.

Affluent populations are consuming more than the natural environment can tolerate. The factors of biodiversity loss listed result directly from consumption of products, which is considerably higher in developed countries. Loss of biodiversity is detrimental both to humans

and to the ecosystem because of the goods and services it provides to both. Out of the 3-30 million estimated species on the planet, scientists have only identified 1.7 million species (National Wildlife Federation, n.d.). The full amount of species is far from classified. It is possible that through the loss of biodiversity *Homo sapiens* are risking benefits to themselves such as in finding the cure to cancer or the solution to hunger. Humans, who show no concern for the ecosystem, should at least show concern regarding biodiversity, if for no other reason than for personal interests. Regard for biodiversity is diverted by consumerism that is promoted by an unsustainable economic model.

Chapter 5 – A Critique of Neoclassical Economics

The previous section defined affluence and traced how affluent populations are compromising biological diversity. These consumption patterns each have one thing in common: their consumers are not aware of the impact of their consumption. Habitat loss and pollution of ecosystems is not seen. Affluent populations do not regularly interact with endangered and threatened species. It is hard to change our behaviors and values if we are not aware of the consequences of our actions. Philosophers and economists such as Herman Daly (1993), Bryan Norton (2002), and Alasdair MacIntyre (1992) have contributed to this discussion with their unique criticisms of the economic theories of unlimited growth, ignorance of consumerist populations, cost-benefit analyses, and “weak sustainability.”

a. Limited Resources on a Finite Planet

Individual economic worth is calculated by consumption. However, it is important to note that there are physical limits to growth, and so there is a logical plateau for a person's worth. Daly argues that unlimited economic growth is impossible and, therefore, unsustainable (Daly, 1993). The economy is an ever-growing entity, but it is not possible to have continued growth considering that the economy is a subsystem of the Earth. Daly examines current trends of growth as “exponential”, advising that it is a deluded model (Daly, 1993). He claims we live on a limited planet with limited resources. When my interview subject was asked if he believed we would run out of resources his reply was, “No because ... of capitalism.”

There is only so much growth that the planet can take before environmental degradation. When the population was significantly smaller, the earth could absorb pollution and resource

extraction. However, human population growth, coupled with advances in medicine, increased the population exponentially, thus growing the demand for resources. Because economic growth met the population's demands, the population continues to believe only the growth of the economy can meet their needs. The environmental field developed in explicit reaction to concern over anthropogenic destruction of the environment. Daly believes that preservation of biodiversity is pointless without first mitigating economic growth (Daly, 1993).

It is important to remember how non-renewable resources are formed. For example, oil was created from microbes that died many millions years ago, even before the dinosaurs (MIT, 2011). Because of the long regeneration time of non-renewables they should not be depleted faster than the rate of their renewal, this is unsustainable. Sustainability means ensuring that future generations have equal access to the same natural resources of today's generation. By continuing the current model of economic growth, our economic system is promoting unabated consumption, resulting in degradation of the Earth's biodiversity.

b. "The Ignorance Argument"

It is important to prepare future generations, of all biological species, for success because it is our ethical responsibility under ecocentrism. There are two difference perspectives on how to do so. Robert Solow's Grand Simplification is an approach involving weak sustainability techniques. The second is more sound and cherished by environmentalists, perpetuating strong sustainability. By tracing Bryan Norton's "The Ignorance Argument" we can analyze the depths of these two approaches and the reasons strong sustainability is preferred, especially in regards to protecting biodiversity.

Norton's comparison between weak and strong sustainability is vast and highly detailed.

He states that in the grand scheme of things, people are inclined towards sustainability, as in they would prefer it. That preference leads Norton to conclude that current generations should have knowledge of their impacts on future generations. The conservation of biological diversity requires us to become mindful of our consumptive impacts so that there could even be future generations of all species. Unfortunately, there are those who would argue that we are unaware of what future generations need.

Solow is an advocate for sustainability under a neoclassical economics context, or as interpreted by Norton, an advocate of weak sustainability. Solow argues that if we leave the next generation with the resources necessary to fulfill their needs; that alone is sufficient. To leave future generations with the same access to capital as current generations, Solow suggests using technology or other resources as a substitute for others. The substitutability of natural capital is termed as 'fungibility'.

The concepts of Solow's argument follow the notions of the Grand Simplification. The term involves oversimplifying the matter of intergenerational equity. The Grand Simplification is based on ignorance, which by claiming ignorance rids current generations of obligation to future generations. Within the Grand Simplification there are three main ideas: 1) fungibility of resources; 2) the distance problem; 3) the typology of effects. The distance problem addresses how far into the future the current generation is responsible for. This ties in well to the typology of effects, or the types of scenarios that can occur. A benign example is if a person cuts down one tree they could replace with a new seed, as opposed to a company clearing an entire forest, which would be extremely damaging to that ecosystem now and in the future. The distance problem and typology of effects are related. Relevant questions beg, for how long into the future are we accountable for our actions? Should we be thinking about the next five generations we

may potentially harm? Will they have access to the resources and the simplistic beauty of the deforested forest?

Norton discredits that it is impossible to predict the needs of the future. It is reasonable to assume that future citizens would like to live in a healthy environment. Environmentalists assume responsibility for future generations and believe in passing on strong environmentally based values. These beliefs, and in turn their actions, such as protecting the environment for intrinsic values sake, are noneconomic. They argue that wealth cannot make up for the loss of natural experience. To compare, Solow wants to save species for the sake of the consumer, whereas environmentalists want to save species for the sake of the species itself. Norton's argument follows more closely with ecocentric values, because he promotes protecting the environment because of its intrinsic value. If future citizens are passed down environmentally based values then biodiversity would be conserved.

Norton discusses how ignorance can affect future generations. He quotes Edmund Burke in his definition of a community, which is a society comprised of the past, present and future. The current generation has benefitted from prior generations in important ways other than wealth, such as in culture and political practices. There is a risk that we will cause non-compensable harm if the natural and cultural history of a place is not conserved, causing a loss of cultural diversity in human populations. A person having this mindset, which allows for the protection of community based values, is a communitarian by Norton's definition. On the opposing side, the Grand Simplification theory revolves around methodological individualism. As mentioned, the individual is prominent in today's society, making it important for companies to quantify an individual's worth (by relying on consumerism) rather than to qualify it. There is no sense of morality because the questions of morality are reduced to those of an empirical

status.

c. ...But it's For the Greater Good!

An important method in neoclassical economics that quantify trade-offs is the cost benefit analysis. In Alasdair MacIntyre's article "Utilitarianism and Cost-Benefit Analysis" (1992), MacIntyre critiques Jeremy Bentham's philosophical theory of utilitarianism, the concept that our actions should maximize the greatest good for the greatest number. However, in the context of a cost-benefit analysis, which questions if the ends are worth the means, utilitarianism can only identify calculable commodities and therefore lacks in its account of social interactions. This is an important concept to analyze because the cost-benefit analysis would not account for biological species, many of which have no utility value.

MacIntyre identifies five key flaws in utilitarian ethic. The first flaw is that there are too many options to consider. When deciding whether a decision is good for the larger sum, it is necessary to use a principle of restriction, which is not a utilitarian principle, and is actually invoked before a utilitarian decision is made. If one were to weigh all options of a decision, it would create a paralysis in thinking because there would be an infinite number of alternatives to consider.

The second fault in Bentham's ethic is that it is impossible to decide between incommensurables and to weigh them against each other. All pleasures are different and all benefits from pleasures are different. However, if the weighing process were even attempted, a non-utilitarian ethic must be applied before the utilitarian principle is used.

A third imperfection is demonstrated via Sir Karl Popper's maxim, which is that the

removal of suffering or alleviation of pain should be prioritized over the promotion of pleasure. The maxim directly contradicts Bentham's rule. Utilitarianism endorses the greatest good, especially including pleasure, however, Popper's maxim regards the removal of suffering first and foremost before pleasure could or should be achieved.

Fourthly, MacIntyre questions, what counts as a consequence to a given action? He states that a precursor principle to utilitarianism (which is non-utilitarian) needs to be applied. The extent of responsibility must be pinpointed before a criterion can be implemented for deciding the effects of consequences, in the framework of the utilitarian principle.

The fifth and final question MacIntyre poses to Bentham is how far into the future is one responsible for one's actions. Similar to all the other responses, a non-utilitarian answer must be provided to determine the principle of restriction before the utilitarian test can be functional. Providing further analysis, MacIntyre discusses the roles of the supplier and the role of the consumer eventually drawing the conclusion that responsibilities of the supplier terminate once the consumer's demands have been met.

MacIntyre evaluates the cost-benefit analysis and examines how it is used for computing the cost of a human life... "One of these considers the individual's own earnings, one the losses to others, one certain socially established norms, and one the individual's own risk-taking." (MacIntyre, 146) Despite MacIntyre's reference to computing the cost of a human life, cost-benefit analyses are often applied to discuss the cost of biological species and their ecosystems, entities which are non-calculable. The biggest question that is asked is "who decides?" Essentially, who plays God? Corporate executives are in charge of decisions such as these. However, it is risky for them to be making these types of decisions because of the restrictions to

their moral thinking. As discussed there are so many alternatives that if all were considered there might be a paralysis in thinking, therefore executives disregard moral thinking and rather use the cost-benefit analysis to decide. The cost-benefit analysis does not represent the long term; it depicts short-term measurability and predictability, discounting future generations and possibly harming current ones.

The sustainability of future generations is of extreme importance, in terms of sustainability for humans and non-humans alike. The current economic model promotes unsustainable consumption of resources, at the same time ignoring the intrinsic value of nature, and claiming ignorance in regards to the needs of future generations. The works of Daly, Norton, and MacIntyre bring awareness of these faults to affluent populations by critiquing the current economic model and asking questions regarding morality and consumption rate. Awareness of these problems is the key in reevaluating over-consumption patterns of the affluent populations. Reevaluation will provide self-reflection and could lead to an overhaul of our value system that may improve protection of the planet's biodiversity. The process of reevaluation begins with the proper education of how affluent consumption patterns are affecting biological diversity.

Chapter 6 – Meat Consumption

Affluent populations' consumption patterns are mitigating biodiversity loss. A primary way this relationship occurs is via the consumption of animal products. Consumption includes meat, dairy, and eggs, as well as material products such as fur and leather. Developed countries have the highest rate of livestock product consumption per capita, with 88.2 kg/year in meat and 212.2 kg/year in milk between the years 1997-1999 (FAO, 2003). In comparison, average consumers in developing countries consumed only 25.5 kg/year in meat and 44.6 kg/year in milk of livestock products per capita within the same time frame (FAO, 2003). The kilocalorie consumption of animal products in industrialized countries is 943 kcal, over 2.75 times more than in developing countries who consume 337 kcal (FAO, 2003). Overconsumption of animal products is concerning due to impacts of production and distribution. Production of animal goods causes deforestation, overgrazing, water depletion, GHG emissions, and pollution (Steinfeld, 2006). By tracing the impact of meat along all points of the production process, we see that affluent populations have a significant impact on the environment, and, therefore, biodiversity loss.

Scientists have found evidence of *Homo sapiens* consuming meat 1.5 million years ago (Domínguez-Rodrigo *et al.*, 2012), evidencing meat as part of human history. However, in the 21st century meat consumption has increased to a point of unsustainability. The environment is being degraded, livestock are grown in uncomfortable conditions, meat is contaminated with viruses and bacteria, and humans with a meat diet have higher medical costs than those with a nonmeat diet (Barnard *et al.*, 1995). The interviewee commented: “But consumption to me is not an evil thing because I respect human beings.” “Evil” is a strong word and I will not be using it

to describe consumption as he does. Rather, excessive consumption, defined where consumption activities are damaging enough to affect other species and the environment, is unnecessary. Additionally, human beings are not being respected because over consumption of meat causes harm to native peoples living in habitats deforested to raise cattle (Bier, 2005). Humans, as well as non-human fauna and flora, are being disrespected and furthermore put in danger due to excessive meat consumption.

a. Deforestation

To raise animals for meat and dairy requires substantial land for grazing purposes. Expanses of land suitable for grazing often exist, but often times large expanses of forested area are cleared for additional grazing. This happens most frequently in tropical rainforests (World Wildlife Fund, 2014), which are the largest hub for biodiversity on the planet: Containing 20,000 species, 8,000 of them endemic (by comparison the tundra houses less than 2,000 species) (Lindsey, 2007). Deforestation poses significant threats of habitat loss and fragmentation (Lindsey, 2007). **Figure 6.1** shows the stark contrast between a forested and deforested area in the Amazon Rainforest. Organisms in the rainforest cannot thrive if there is significant damage to primary habitat. Tropical rainforests have high amounts of endemic species, species that only occur in a specific location. Biodiversity loss is greater in tropical forests due to their high number of endemic species. Extinctions occur if specialized species only occupy that specific deforested area, or if species are unable to migrate and find a niche after habitat fragmentation (Lindsey, 2007). *Panthera tigris sondaica*, the Javan tiger, occurring naturally on the island of Java in Indonesia have become extinct since the mid -1970s (Jackson and Nowell, 2008). Cited causes of extinction include hunting, loss of prey, and loss of forest habitat (Jackson and Nowell, 2008). Land was cleared for agricultural purposes and the species quickly became extinct with

further development (Jackson and Nowell, 2008). The species was endemic to the island of Java and exists nowhere else in the world (Jackson and Nowell, 2008).



Figure 6.1 Illegal deforestation in Para, Brazil.
Source: Croasdell, 2008

b. Greenhouse Gas Emissions

Deforestation also contributes to GHG emissions. Tropical floras are carbon sinks: They absorb carbon dioxide from the atmosphere, allowing oxygen production via photosynthesis. When photosynthetic organisms are destroyed, stored CO_2 is released back into the atmosphere. The World Wildlife Fund notes, “deforestation represents around 15% of greenhouse gas emissions” (World Wildlife Fund, 2014). As reviewed previously (chapter 4), an increase in GHG’s contributes to global climate change, which has profoundly threatening implications for biodiversity. Climate change increases the occurrences of extreme weather events capable of

devastating areas with floods, droughts, fires, etc. (Field, 2012). Some species may be more equipped for adaptation; however others may not be able to locate food or fresh water necessary for survival.

Animal production significantly contributes to GHG's, responsible for 15-24% of all emissions (Fiala, 2008). Notable emissions come from methane (CH₄) and carbon dioxide (CO₂). Ruminants produce methane internally during a process named enteric fermentation. Enteric fermentation breaks down food substances, typically cellulose, creating the byproduct methane, which is then released via belching and flatulence. In the agricultural sector, total methane released by ruminants equals 45% (UNEP, 2012). Methane has 21-times the Global Warming Potential (GWP) than standard carbon dioxide during a 100-year period (EPA, 2013).

Emissions also come from the buildings housing the animals. According to UNEP, as per capita income increases, meat consumption increases (UNEP, 2012). In order to accommodate escalating demand for meat, production processes have become highly mechanized. CAFO's (Concentrated Animal Feeding Operation) have become the near-exclusive production method. By mass-producing meat, CAFO's are able to meet rising demand. Animals are kept in very close quarters, typically indoors with artificial lighting; a warehouse for animals to live. In order to keep the warehouse at the optimal environmental condition for the animal to grow, electricity is utilized. A staggering statistic provided by Fiala is as follows:

... [I]f current consumption patterns continue, the amount of total meat consumed in the year 2030 will be 72% higher than the amount consumed in 2000, lead mostly by large increases in chicken and pig consumption. ... [T]he production of this meat in 2030, under CAFO systems, will produce almost 1.9 billion tonnes of greenhouse gases. (Fiala, 2008)

CAFO's are substantial producers of GHG. Another avenue of emissions is from the refrigeration and transportation of animal from factory to supermarket. Agricultural emissions are the third largest contributor to GHG's (Reynolds, 2013); however meat eating makes its impact by constituting nearly 80% of emissions from the agricultural sector (UNEP, 2012). An excessive amount of GHG's in the atmosphere contributes to climate change.

c. Waste from CAFO's

CAFO's are not only recognized for their intense electricity usage, but their massive amount of waste. Burkholder *et al.* states that per year in the United States CAFO's produce "133 million tons of manure (on a dry weight basis)... representing 13-fold more solid waste than human sanitary waste production" (Burkholder *et al.*, 2006). This waste creates two major environmental issues. First is air pollution, which releases ammonia, hydrogen sulfide, methane, and particulate matter (Hribar, 2010). This typically affects people who live in areas near the factory farm. The matter is able to cause major health problems including asthma, chronic lung disease, chronic bronchitis, inflammation of the eye and respiratory tract, etc. (Hribar, 2010).

Second is runoff of manure waste. Sometimes manure is not managed properly and will leak into the water system, occasionally facilitated by rain. When manure is leaked into large waterways it causes a "dead zone." "Dead zones" occur when nutrients from manure, such as nitrogen and phosphorous, enter a water system causing eutrophication. The high content of nutrients allows microorganisms to bloom excessively, and upon their death they uptake large quantities of oxygen depleting the area of oxygen entirely (Art, 1993). Marine organisms die out from the lack of oxygen. There is currently a "dead zone" in the Gulf of Mexico where no aquatic life resides (**Figure 6.2**). The "dead zone" extended a record 8,500 square miles in the summer of 2002 (Natural Resources Defense Council, 2013).

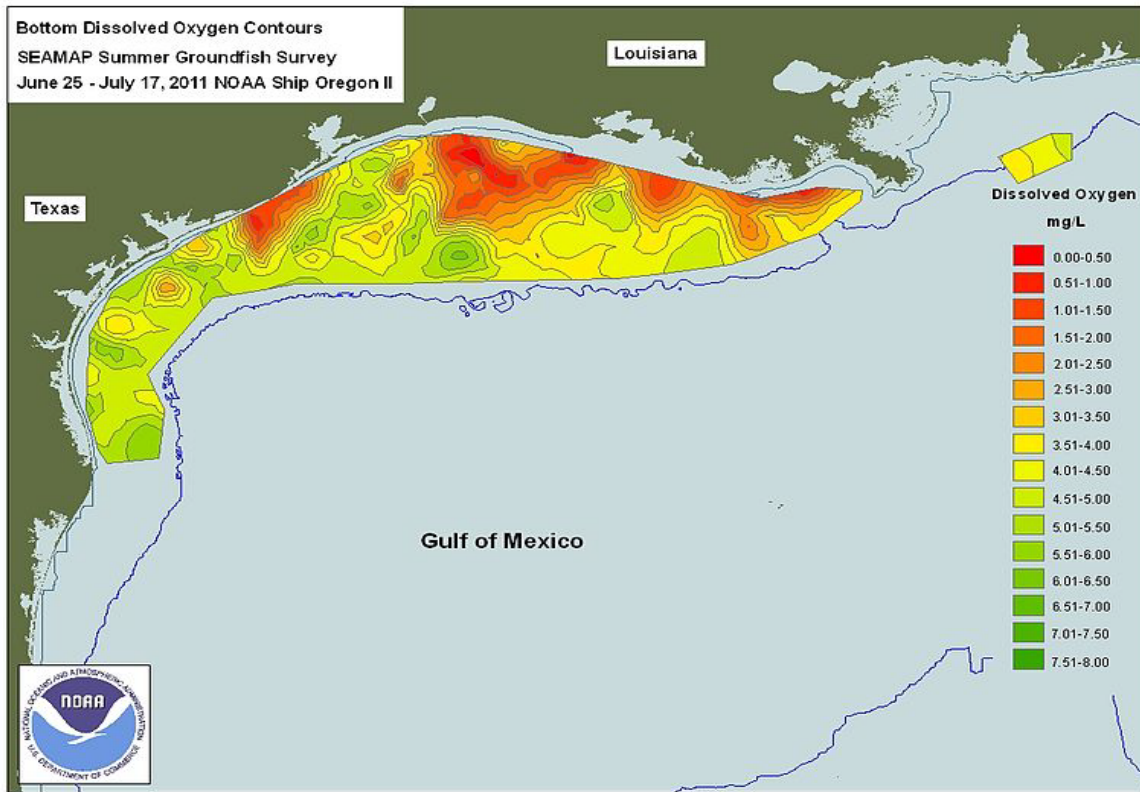


Figure 6.2 Dead Zone in the Gulf of Mexico.
Source: NOAA, 2010

d. Livestock Overgrazing

Livestock overgrazing directly contributes to soil erosion and loss of soil further threatening biodiversity. Large trees and plants act as anchors for soil (World Wildlife Fund, 2014). Deforestation causes soil to become weak and no longer anchored. This “liberation” erodes soil, making it easily displaced by rain or wind. The combination of erosion and overgrazing makes the land infertile; as a result natural flora is unable to re-grow. Farmers report being unable to restore previously eroded land for agricultural purposes (Rayburn, 2000). Because nothing is able to re-grow, land becomes dry and bare, hence the term “desertification.” Overgrazing leads to biodiversity loss because it prevents the growth of organisms that would contribute to the diversity of the biota in a particular region.

e. Water Consumption

Sustaining livestock populations requires substantial food and water supplies. In order to produce 1 kilogram of beef it requires 15,500 L of water, whereas 1 kilogram of wheat requires only 1,300 L (Wetlands International, 2010). The water necessary to raise animals for meat production is staggering when considering the amount of freshwater available on the planet. According to Wetlands International, “70% of the Earth’s surface is water, however only 0.3% of all global water is fresh surface water” (Wetlands International, 2010). Animal agriculture uses 8% of the total available water on the planet, including the water animals drink and the water necessary to grow food for the animals (Schlink *et al.*, 2010). More consumption of animal-based protein means a direct reduction in water sources globally (Wetlands International, 2010). Besides *Homo sapiens*, an estimated 126,000 non-human species depend on fresh water... solely for habitat purposes (Wetlands International, 2010). The Worldwatch Institute mentions that *H. sapiens* use “half of the available freshwater on the planet” (Worldwatch Institute, 2004). It is important to recognize that biodiversity supports healthy ecosystem functioning and that humans massively benefit from these services. When ecosystems cannot function due to the lack of freshwater, the system is at risk of failing, which results in biodiversity loss and a threat to global public health.

The consumption of meat by affluent populations is significant enough to cause environmental damage and therefore a reduction in biodiversity. The life cycle of animal agriculture has caused species’ habitats to be lost and polluted. Species of all sorts are affected: microorganisms, plant life, non-human animals, and human animals. Affluent populations need to be cognizant of the impact of their consumption so they can take measures to change their behavior. Behavior changes will improve conditions of the planet’s biodiversity. The chairperson

of the Intergovernmental Panel on Climate Change (IPCC), Rajendra K. Pachauri states: “As head of the IPCC, we have talked about lifestyle changes being an important means for reducing emissions of greenhouse gases... I said eat less meat, you’ll be healthier and so will the planet” (The Economist, 2010). If affluent populations cannot cut meat altogether then it would be beneficial to significantly reduce consumption to preserve biodiversity.

Chapter 7 – Electronics Consumption

Affluent populations have the financial resources and abilities to purchase expensive electronic products. High consumption of electronic goods correlates into a large amount of electronic waste, or “e-waste.” E-waste consists of discarded cellular devices, laptops, desktop computers, tablets, televisions, refrigerators, etc. By 2016, developed countries will produce twice as much e-waste than those in developing countries (Causes International, 2014).

Electronic consumption is devastating to biodiversity at all points in the production process from extraction to landfill. In order to trace the impact of electronic consumption, it is necessary to examine the following steps in the overall workflow: extraction of raw materials, material manufacturing, shipping and packaging, consumer consumption, and waste.

I asked my interviewee if he was concerned over the current state of the environment, to which he replied “yes”; he later stated “...we are unaware of the cost we are imposing on ourselves globally through the production of local product goods and services.” I argue that we *are* aware of the costs due to the incredible depth and range of scientific studies and economic analyses. “Cost” is defined as holding monetary value, however it also has profound social implications, notably in the cost of human and ecosystem health.

a. Mining for Metals

Metals included in the manufacturing of electronics are highly specialized and serve specific purposes due to their physical and chemical characteristics, such as melting point and conductivity. **Figure 7.1** outlines the resources, mainly metals, needed in the production of a

smartphone. Some of these metals are extremely rare, highly specialized, and are of limited supply, one of which is Tantalum.

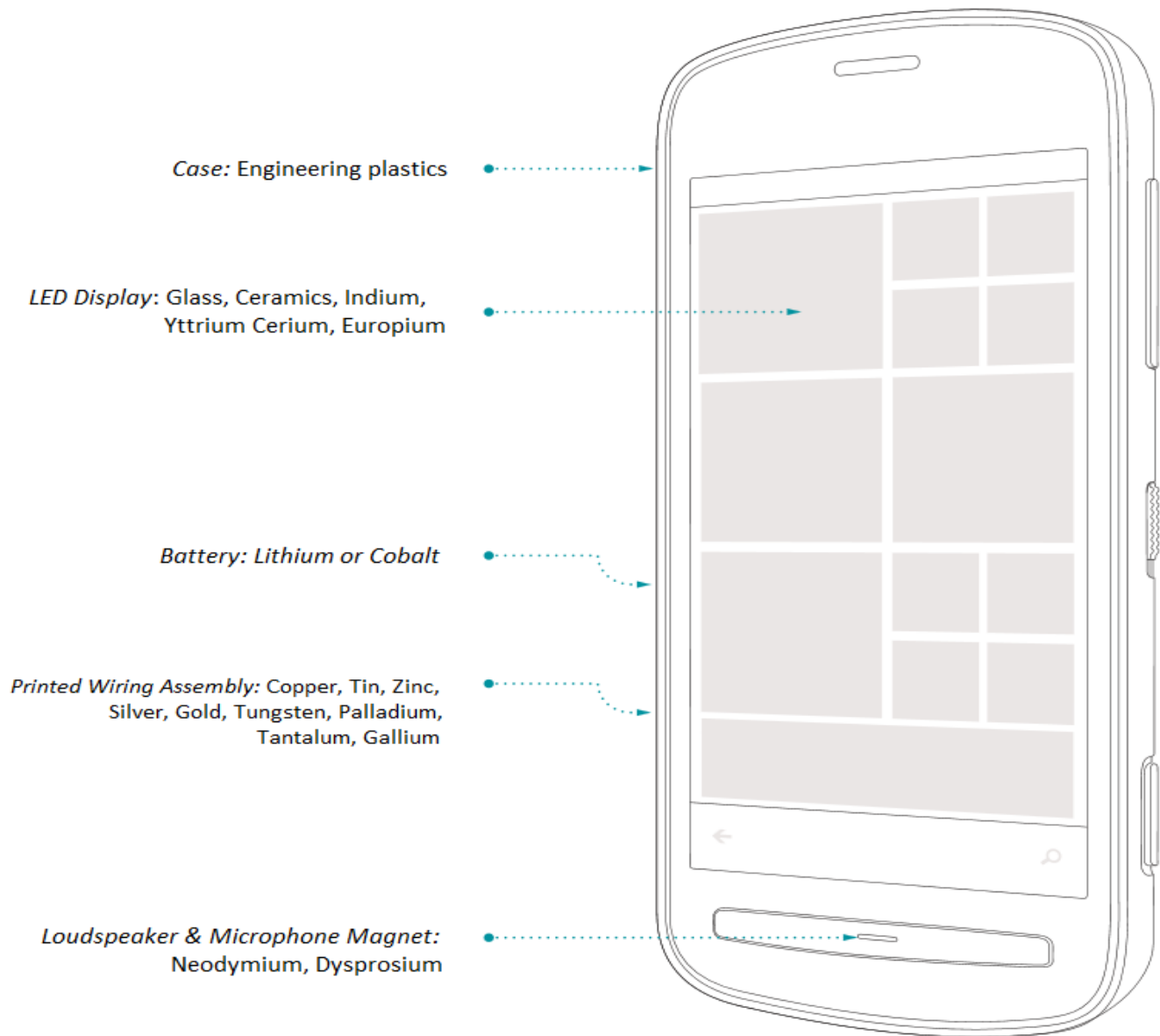


Figure 7.1 Resources needed in the production of smartphones.
Source: ERT, 2013

Tantalum (combines with niobium to create coltan) is used to make a capacitor in electronics to facilitate the flow of electricity (Hayes and Burge, 2003). It is mainly mined and has concentrated supplies in Australia (reaching 41% world production of tantalum in 2001 [Hayes and Burge, 2003]), Brazil, and Thailand. However, due to increased demand, the reserves

for tantalum in Australia have declined (International Consortium of Investigative Journalists, 2012). Extraction of tantalum and the associations of extracting tantalum are able to degrade biodiversity in the local area. For example, there are various methods for mining tantalum, however two types that are efficient in degrading biodiversity is open mining and according to Hayes and Burge, “artisan mining of surface alluvial deposits using pick and shovel”(Hayes and Burge, 2003). Open mining is prominently used in Australia when extracting Tantalum. The process uses large amounts of energy to power massive machinery during the extraction process. Substantial amounts of dirt and rock are removed, degrading biodiversity by destroying the habitat of species living in the particular area. It is also possible for radioactive and toxic elements to leak into bedrock or be released into the air (MIT, n.d.).

The pick and shovel method is used in the Democratic Republic of Congo, which now supplies one-fourth of the world’s coltan (International Consortium of Investigative Journalists, 2012). Habitat is being reduced through direct extraction of metals. The majority of coltan is extracted from Kahuzi Biega National Park where miners have been driven in search of coltan. In order to sustain themselves they’ve been killing, without bias, all the animals in the park. All elephants and Grauer’s gorillas in the national park are gone and the Grauer’s gorilla population “has been reduced from 17,000 to 2-3,000 in three years, an 80-90% decline” (Bailey, 2000; Redmond, 2001; cited in Hayes and Burge, 2003).

b. Processing and Handling

Before materials can be assembled to make a complete product, they must be combined with other raw materials. This process requires large amounts of energy, water, and chemicals, some of which are extremely toxic. In the computer manufacturing industry alone, “at least 240

kilograms of fossil fuel, 22 kilograms of chemicals and 1,500 kilograms of water... [are required for] an average 24-kilogram computer and 27-centimetre monitor” (UN News Center, 2004).

The packaging and shipping of electronic devices poses significant damage to the environment. In order to ship such a delicate device, sturdy packaging is necessary. Mobile phone packaging is typically a bundle of cardboard, plastic, and aluminum. Each of these materials comes from natural resources: cardboard from trees, plastic from petroleum, and aluminum from ore (EPA, 2004). Regarding shipping, the coltan in a smartphone is mined from the DCR in Africa, makes its way to China for assembly, then transported to an affluent country. It still must be shipped to every other electronic store in the United States. The carbon footprint of just one mobile phone from manufacturer to shipper to user is approximately 130lbs of CO₂, which, according to the Aussie Recycling Program is “almost 26 litres of fuel,” or about 7 gallons of gasoline (Aussie Recycling Program, n.d.). 156 billion pounds of CO₂ is emitted from 1.2 billion mobile phone users worldwide (EPA, 2004). Both packaging and shipping have profound effects on biodiversity from resource extraction and CO₂ emissions, thereby contributing to habitat loss and climate change.

c. Fossil Fuels to Power Server Farms

Different electronics have different life spans. The average iPod can last for two to three years; a television can function for over ten years; and a cell phone can work for approximately four years (CNN, 2007). Data is generated over the phone or computer’s lifespan. Many people in affluent countries have both and use large amounts of data daily. A study conducted by the University of California, San Diego predicts that by 2015 a volume equal to “the daily consumption of nine DVDs worth of data per person per day” will be used (Zverina, 2013). All

of this data is transmitted and stored in large buildings called server farms and data centers. Companies such as Google, Microsoft, Amazon, and Yahoo have server farms (Katz, 2009). These buildings have tens of thousands of servers, which require massive amounts of electricity to run and just as much for cooling purposes (Katz, 2009). In 2011, the EPA released a figure showing the energy sector as the highest emitter of greenhouse gases, at 33% (EPA, 2011). These emissions are byproducts of fossil fuel consumption: coal combustion, and petroleum and natural gas consumption. The overall carbon footprint of the Information and Communication Technology sector is “about 2% of the estimated total emissions from human activity released that year [2007] (a figure equivalent to aviation)” (CEPIS, n.d.). With more people able to afford cell phones and laptops, more data will be used and more energy will be needed to support these consumers. CO₂ emission is a prevalent theme in the consumption pattern of affluent populations. Extraction of fossil fuels for energy and emissions of CO₂ will reduce biodiversity through habitat loss and climate change.

d. E-Waste and Bioaccumulation

The final step in the life cycle of the electronic product is the waste. Developed nations produce the most e-waste, with approximately 20-25 million tons of waste produced per year (Robinson, 2009). Unfortunately, e-waste is highly toxic and is often disposed of in landfills, with only 25% of televisions, computers, and cellular devices being recycled in 2009 (EPA, 2012). Some e-waste is disposed of in the developed countries that it was primarily used; however the majority of e-waste is dumped in China and India (Pinto, 2008). Toxic chemicals are present in electronic devices; some well-known ones are lead, nickel, cadmium, and mercury (Pinto, 2008), three of which (lead, cadmium, and mercury) leads to a process called

“bioaccumulation” in organisms such as microorganisms, plants, and animals (Iowa: Department of Natural Resources, n.d.).

The U.S. Geological Survey defines bioaccumulation as “the biological sequestering of a substance at a higher concentration than that at which it occurs in the surrounding environment or medium.” (U.S. Geological Survey, 2007). Bioaccumulation of toxic chemicals is severely detrimental to a biological organism, as it results in a range of destructive pathologies and threats to the individual’s and species’ survival. For example, bioaccumulation is a frequently observed phenomenon in marine ecosystems: the smaller organisms uptake mercury, and as the food chain narrows the mercury concentrations become higher. The result is that the larger organisms, such as Bluefin tuna, are highly toxic due to the amount of mercury present in the organism (*The Cove*, 2009). **Figure 7.2** details the process of bioaccumulation. The Natural Resources Defense Council suggests that women who are pregnant or likely to become pregnant should not eat more than “two cans of light tuna per week” (NRDC, n.d.). Thus, e-waste is directly detrimental to *Homo sapiens* populations as well.

Biodiversity loss occurs as a result from affluent consumption of electronic goods. Habitat loss, global climate change, and toxic contamination are products of the electronic life cycle. Adequate scientific research is available proving that the production of electronics causes these significant negative externalities. In order to reduce our impact on biodiversity, it would be conducive to reduce our consumption of electronic goods. To quote philosopher Mokokoma Mokhonoana, “don’t obsess over having the 'latest' version of a product. For there was a time that the previous version was the latest” (Mokhonoana, n.d.).

Bioaccumulation in Action

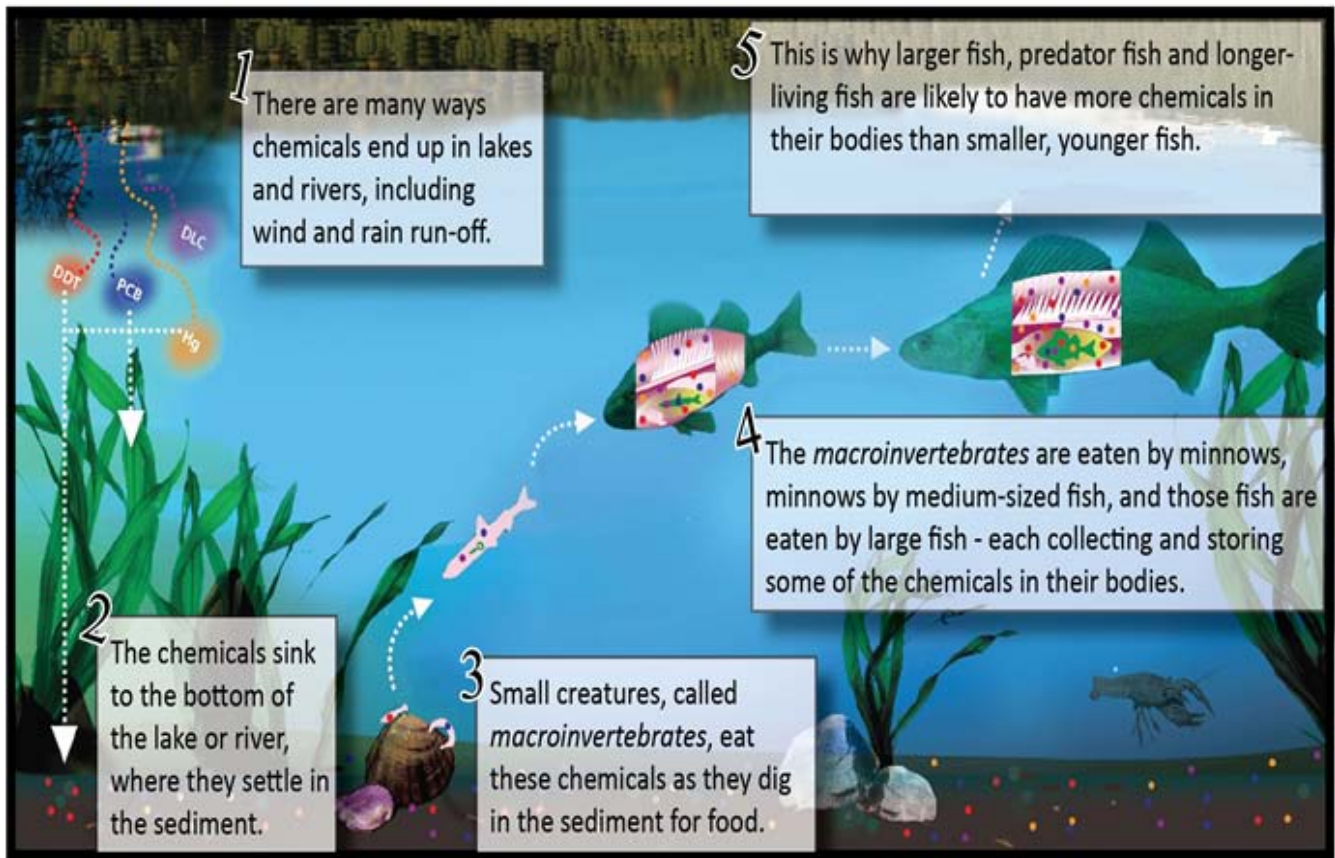


Figure 7.2 Bioaccumulation of particles in marine organisms.
Source: Michigan Department of Community Health, n.d.

Chapter 8 – Automotive Vehicle Demand

Automotive vehicle demand consumes more than 531 million cars worldwide (Worldwatch Institute, 2004). The United States demands 25% of all vehicles produced worldwide, a number roughly equaling 132.75 million (Worldwatch Institute, 2004). Motor vehicle ownership in developed countries is 200 cars for every thousand people; in comparison a country like China only has 15 cars for every thousand people (PBS, 2004). Affluent populations are of specific concern due to their high ownership of vehicles. A proper life cycle assessment will provide evidence that production and ownership of motorized vehicles is particularly harmful to the environment. An analysis of processes including raw materials extraction, manufacturing, and usage will be provided to illustrate the loss of biodiversity from automotive vehicle demand.

The interview subject held a very interesting view specifically on the pollution of the automobile. When asked: "...[Y]ou think technology will solve the problems? Increasing technology?" My interview subject replied:

Isn't the automobile one of the greatest pollution fighting mechanisms ever developed? If you looked at the cities 100 years ago ... [t]hey are far more polluted because of the horse and carriage system that was in post. Horses ... produce a lot of waste ... [a]nd when they die in the street they produce things like diphtheria and other diseases. History didn't begin in 1990, it began before that and that means that the car and aggregate has lowered pollution on the planetary level.

His argument is that earlier horse and carriage transportation systems created waste products that severely threatened public and environmental health. While

traditional transportation systems may indeed pose dangerous problems, I disagree that “the automobile [is] one of the greatest pollution fighting mechanisms ever developed.” The life cycle assessment of automobiles will prove that cars are responsible for a significant amount of air pollution, affecting the global population of both humans and non-humans.

a. Extraction of Metals

As with all products, vehicle production requires significant extraction of natural resources. Resources required include non-renewable precious metals: platinum (Pt), palladium (Pd), and rhodium (Rh) and rare earth metals: neodymium (Nd), dysprosium (Dy), and terbium (Tb) (ERT, 2013). These metals are obtained through the mining process, requiring energy from fossil fuels (petroleum and coal). Extraction of these metals also contributes to resource depletion. Mining of any natural habitat instantly displaces native species. Displacing species explicitly contributes to biodiversity loss.

b. Adverse Effects of Manufacturing Plants

Raw materials are transported to manufacturing plants, consuming large amounts of energy and are thus major atmospheric polluters. Manufacturing plants using oil for electricity contribute to biodiversity loss. Oil is burned at power plants for electricity; this process requires large amounts of water for cooling purposes, and discharges wastewater that is warmer than its surroundings (EPA, 2013). Warmer water affects ecosystem composition by increasing respiration rates of aquatic organisms, requiring them to consume oxygen faster (Neves and Lourenço, 1996). This decreases dissolved oxygen creating an anaerobic environment, in which aquatic organisms requiring oxygen cannot

survive (Neves and Lourenço, 1996). Thermal shock also occurs in organisms that are suddenly exposed to temperatures above their optimal range (University of Georgia, n.d.). Shock interferes with the growth and reproductive processes of aquatic life (University of Georgia, n.d.). Other negative externalities of oil power plants result in habitat loss driven by climate change, via air pollution of carbon dioxide and methane (EPA, 2013).

Manufacturing plants are responsible for the release of volatile organic compounds (VOCs). VOCs are gaseous chemicals released into the atmosphere (EPA, 2012). In car manufacturing processes, VOCs come from the painting stage. Auto body shops also produce VOCs when using paint, and, according to the University of Michigan, “[i]n the State of Michigan, these paint-shop solvents account for almost one-fourth of all pollution from volatile organic compounds” (Melosi, n.d.). VOCs are harmful because of their adverse effects on human health. They harm humans by causing “[e]ye, nose, and throat irritation; headaches, loss of coordination, nausea; damage to liver, kidney, and central nervous system” (EPA, 2012). The EPA also cites that VOCs have caused cancer in animals (EPA, 2012). Biological diversity is thus significantly affected by the VOCs released in the automobile production process.

c. Road Construction

An increase in cars means more roads. However, road construction poses its own environmental risks, including the destruction of habitat and disruption of reptile and amphibian migratory patterns (Daigle, 2010). Soil and biogeochemical regulatory cycles are both severely disrupted by the expansion of transportation roadways (Daigle, 2010).

Stream morphology is altered and debris from road construction can cause increased turbidity, or cloudiness, in nearby waterways (Daigle, 2010). Turbid water can be harmful to biodiversity for a variety of reasons: Turbid water can prevent sunlight from reaching light-dependent organisms (EPA, 2012). Sediments may also clog the gills of fish, and increase susceptibility to diseases (EPA, 2012). It's detrimental if suspended materials settle because it could cover fish eggs and other forms of life on the riverbed (EPA, 2012). As evidenced, road construction is a significant source of biodiversity loss.

d. Impacts of Motor Vehicle Use

The impact of motor vehicles on biodiversity is at its greatest during vehicle use (Harrington and McConnell, 2003). Impacts include soil erosion, associated impacts with gasoline consumption, and air pollution. Accelerated soil erosion is an environmental impact stemming from the use of off-road vehicles (ORV) (Webb *et al.*, 1978). When ORVs are used in areas not designated specifically for driving it begins to remove topsoil, the fertile soil used for vegetative growth (**Figure 8.1**). This is a dilemma because it takes topsoil 300-500 years to produce just one inch (Webb *et al.*, 1978). Biodiversity is negatively affected because vegetation is unable to grow back. ORVs are also able to erode sand dunes, which is especially a problem near the shore because sand dunes act as natural storm barriers.

The energy used to power motorized vehicles, gasoline, is a liquid that causes environmental damage in its extraction and use. Extraction of gasoline on both land and in marine environments is risky and has led to oil spills. Drilling on land is risky because the metals of the drilling pipeline could corrode and burst, leaking oil into surrounding



Figure 8.1 Topsoil damage from Off Road Vehicle use in Los Padres National Forest, California.

Source: Los Padres ForestWatch, Inc.

land and waterways (Rainforest Foundation US, n.d.). Leaking could occur without rupturing because waste pits are usually left unlined (Rainforest Foundation US, n.d.). Offshore drilling threatens marine environments with oil spills. Oil spills damage marine organisms and birds by covering them in oil, exposing them to toxic substances, ultimately killing them (EPA, 2014). Fish will sometimes ingest oil, mistaking it as food. The actual act of drilling can also harm the seabed, where many sedentary organisms live (NRDC, 2009). The noise of drilling can also disrupt migratory whales (NRDC, 2008).

Gasoline consumption contributes to air pollution. An air pollutant from motor vehicle use is ozone (EPA, 2001). Ozone (O_3) is not a direct pollutant from automobiles, it is formed through the chemical reaction of NO_x and VOCs, both originally emitted from motor vehicles (Harrington and McConnell, 2003). Ozone is an air pollutant that is able to cause respiratory illnesses. Lung function decreases while coughing and chest

pain increases (NYS Department of Environmental Conservation, n.d.). Scarring of lung tissue can occur if there is repeated exposure to either low levels of ozone over a long period of time or high levels for a short period of time (EPA, 2013; Arizona Department of Environmental Quality, n.d.). Ground level ozone is also able to inflict damage to ecosystems. Members of the ecosystem most susceptible to ground level ozone are vegetation. Sensitive plant species include the black cherry, quaking aspen, ponderosa pine and cottonwood (EPA, 2011). Ozone affects sensitive plants by interfering with its acquisition of energy and metabolic functions (EPA, 2011). **Figure 8.2** shows phenotypic damage of an organism (EPA, 2011). These impacts leave the organism vulnerable to disease, severe weather, and damaging insects (EPA, 2011). Death of the organism from any of these occurrences can reduce the species diversity in that locale, decreasing biological diversity.



Figure 8.2 Visible damage on a leaf affected by ozone pollution.
Source: EPA, 2011

Biodiversity is diminished through the loss of habitat and topsoil as a result from resource extraction, soil displacement, ORV use, oil drilling, and pollutants including VOCs and ozone. The environmental effect of automobile consumption is, as evidenced, vast and felt by both humans and non-humans alike. Even though motorized vehicles revolutionized travel since the day of the horse and carriage, it is still necessary to raise awareness of the impacts automobiles impose on the environment. An alternative to personalized transportation is public transportation. By creating a demand for public transport it can pressure local governments to improve infrastructure, especially in areas where it is not so strong.

Chapter 9 – Conclusion

Affluent populations consume the most resources; according to Washington State University, “the poorest 10% account[s] for just 0.5% and the wealthiest 10% account[s] for 59% of all the consumption” (2008). However, individuals residing within developed nations are largely unaware and ignorant of their personal environmental impact because it is convenient for them to remain uneducated, unaware, and irresponsible. In the case of excessive consumption, ignorance is not bliss. Claiming ignorance does not make the issues disappear, rather it prevents the problem from being solved at its source. Changing one’s environmental impact is confronted perfectly by my interview subject regarding using a reusable water bottle, “...it increases my inconvenience, my cost of transacting.” It is less convenient for consumers to understand their impact because they will need to change their consumptive behavior.

Excessive consumption puts biological diversity at risk for long-term harm. Reducing our consumption is important because of biodiversity’s inherent value. When biodiversity is diminished, everything is affected... including human and non-human species. Species are steadily going extinct, and even humans are losing their lives through loss of habitat and environmental stressors. It is important to remember that the conservation of biodiversity is crucial. From an anthropocentric view, biodiversity is able to provide food security, aiding in the adaptability of crops from external disturbances; access to clean water, ensuring high water quality; natural storm barriers, protecting coastal communities; and a diversity of organisms that are useful for medicinal, agricultural, and cosmetic purposes (UNEP, 2010). However, under the ecocentric ethical theory, biodiversity doesn’t need protection for the sole reason to benefit humans. Biodiversity deserves protection because of its inherent value; it has a good of its own.

By placing humans within the scope of the ecosystem, and not above it, all biological diversity is equated. This equality ensures respect for all forms of life. Yet, we are still far from achieving complete respect due to the policies of the economy.

Current economic policies are based on the theory of utilitarianism. These policies are unethical because they advocate unlimited consumption. Affluent populations take full advantage of this policy by consuming without concern for their impact. Philosopher Joseph DesJardins proposes, “we should treat the desires of the people of the future as deserving consideration equal to the desires of people today” (DesJardins, 1997). By applying ecocentrism, we can take DesJardins’ suggestion further by attributing consideration to the entire ecosystem. By assuming generations of all kinds want, or rather *need*, equal access to a clean and healthy environment, we can move forward in making responsible consumption decisions.

In order for affluent populations to significantly reduce their impact on biological diversity, a change of values is necessary. Dale Jamieson commented that, “what we need are new values that reflect the interconnectedness of life on a dense, high-technology planet” (Jamieson, 2002). There are alternatives to living a successful and fulfilling life without adopting excessive consumerism ideologies. The rational person, if aware of the impacts of their consumption, would immediately change their values to accommodate the preservation of biological diversity. Consumer education regarding environmental impact is integral in creating a society that is making responsible decisions concerning biodiversity.

Education is the most important tool to raise awareness of the impact on biological diversity from affluent consumption. Citizens of affluent nations are constantly engaging environmental education initiatives, and a market for sustainable goods is being created. Stark examples of the sustainability movement include sourcing food responsibly, a principle that the

supermarket Whole Foods was founded upon. The fashion industry is also becoming more eco-friendly, creating clothing from sustainably sourced fabric, used in garments made by small businesses: Feral Childe and Titania Inglis. I even own shoes that were recycled from Tyvek, a synthetic material used to protect houses from water during the construction process.

Affluent populations have the means to vote with their dollar, thereby creating demand for a socially-desired product. By buying sustainably-sourced and -created products, affluent populations can establish a market for goods that would significantly help in *reducing the impact* of the average affluent citizen. Some companies use a labeling system called Ecolabel, marking goods, both food and consumer products, that are created sustainably. This is a purely voluntary label, and I believe for ultimate effectiveness, all companies should be required to share the environmental impact of their product. Another method would be to incorporate the full cost of a product, including its ecological footprint, into pricing. This may discourage consumers from buying unsustainably made products and encourage them to buy more sustainably. The sustainability of our consumption will improve consumer-nature relations, fostering ideal conditions for the conservation of biodiversity.

Environmental education is incredibly important in keeping the planet healthy and functional for humans and non-humans alike. Education regarding environmental issues should begin in early childhood and continue well into adulthood. I sincerely believe that if affluent populations were aware of their impact, there would be much less environmental degradation and biodiversity loss. Education would create an “ecological identity” for every person, defined by Thomashow in Kahn as “how people perceive themselves in reference to nature, as living and breathing beings connected to the rhythms of the earth, the biogeochemical cycles, the grand and complex diversity of ecological systems” (Thomashow, 1995; cited in Kahn, 1999: 223). The

biological diversity of this planet is vast and encompasses life of all sorts. By placing ourselves within this system we will learn appreciation for biodiversity and conserve it for every species.

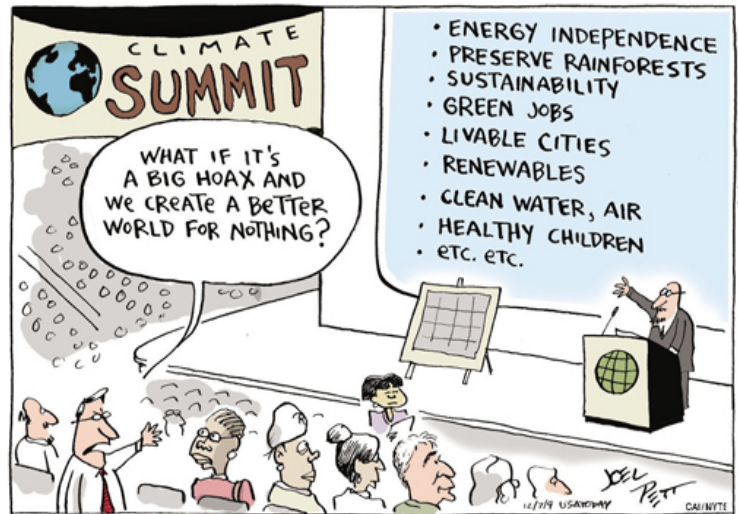


Figure 9.1 Climate Summit cartoon.
Source: Swarthmore College, n.d.

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APPENDIX A: Interview

INTERVIEWEE: But to help you I would have to look into it a little bit more because there's a lot of controversy revolving around this issue ... I'm sure some activities that occur in affluent and non-affluent countries harm biodiversity and others probably improve biodiversity but the whole question is I don't know if there is an optimal way to measure biodiversity. I don't know if more is always better in this case. Or you reach a point where you have a stable ecosystem where you have a level of biodiversity is optimal and more than that results in a cycle of deaths or a contraction of a population because it's incompatible with essential elements of the ecosystem. So that's some things that I would have to look into, the current thinking on the field. ... And of course then you have to ask yourself the question what level of biodiversity is desirable, which is difficult to answer because we don't understand the full impact of how ecosystems operate so that's the real challenge.

MF: So my first question is "Do you think that there is a cause for current concern about the state of the natural environment?"

INTERVIEWEE: Yes.

MF: Okay, why?

INTERVIEWEE: Obviously the environment's essential to human life, non-human life, economic growth, and sustainable development. And we've noticed changes in the environment and I would expect that given what we know of astrophysics and the history of the universe, the environment, or the Martian environment, the lunar environment ... environment's change over time. Some of this change is a reflection of natural processes and some may be a reflection of productive processes that are not natural and you want to see if there is anything occurring that's due to economic production which is creating negative externality in the environment. ... Negative externality, I would say is that we are unaware of the cost we are imposing on ourselves globally through the production of local product goods and services. It's a matter of concern and that's why there are scientists who have to study it and who have to measure it. I'm always concerned about fisheries and ocean biodiversity and the increase of jellies and things like this I think are very important. Good area of study, good area of concern.

MF: And I guess playing off that question, "Do you believe consumption plays a role in environmental degradation?"

INTERVIEWEE: I think that question is too broad because consumption has to be better defined. In economics we always say there's a tradeoff so is there a cost of consumption? Yeah, there's got to be benefits, there's got to be costs. If you want to wear a flower in your lapel that means there is one less beautiful flower growing happily left alone in the meadow. And if you want to wear a fur coat that means that a bunch of animals got skinned probably dying horribly. So your exact question was... ?

MF: Does consumption play a role in environmental degradation?

INTERVIEWEE: It has to! There's a trade-off in economics, however the role may be exaggerated or it may be worth further study, on the other hand I certainly wouldn't suggest that, with the current state of knowledge that any group has the right to restrict other people's consumption based on the fact that our knowledge is very primitive I feel. And our models that we use are very primitive and that's common in a lot of fields, not just climatology and environmental science. It's true in economics too.

MF: What do you believe are some environmental issues we are facing today? If any at all?

INTERVIEWEE: It's a long list. Everything from disposal of radioactive waste material to depopulation of fisheries...

MF: So you think these are important issues?

INTERVIEWEE: Very important.

MF: Should we address them?

INTERVIEWEE: Yeah, sure!

MF: In what way do you think that they should be addressed?

INTERVIEWEE: You study them and you try to determine causations if possible. The one thing I don't believe in is turning scientific inquiry into religion. And that's what I accuse environmental movements of doing and I think that the most outrageous example of that is Obama telling people that the climate debate is resolved and now we have to act. It may be resolved in his mind but I never saw him get a science degree in school. The fact that the political leader has the nerve to come out with that and others who are complete hypocrites like Bloomberg, have the nerve to jet around on corporate jets and have a huge carbon footprint, by telling people with lower incomes to cut back on their consumption and other possibility degrading effects on the environment. I don't believe in that. I think that's a form of fascist behavior.

MF: Just of out curiosity, do you think that affluent people should reduce their consumption instead of them telling the poorer populations?

INTERVIEWEE: I think that I'm much more impressed when people lead by example. I don't like a hypocrite like Gore or Obama or Biden to send their kids to private schools and then say to other people you should only send your children to public schools. And I don't like a guy like Gore who has a mansion with 25 restrooms and at the same time is suggesting people alter their lifestyle to conform to his concept of what proper human behavior relative to the environment should be. Is he a priest of some sort? Does he have divine insight? I recall he was a mediocre student at best and his movie that he made was complete and total nonsense filled with a lot of scientific fallacies. So I resent that and I think that the cost of human liberty should alarm anyone who calls themselves progressive and who cares about human freedom. I do not believe human freedom is telling other people what to do. But if you want to lead by example I am really willing to listen. I would like to read about that but I haven't seen any examples yet. Does Obama consider the use of Air Force 1 for vacations when he's worried about its pollution in the

environment? Planes pollute a lot, especially 747s. So I don't believe we live in a class society that's enforced by an upper class that's a political class. That's where I come from on it.

MF: Next question, are you at all concerned that we will run out of natural resources?

INTERVIEWEE: No because we won't.

MF: Okay, why not?

INTERVIEWEE: Why not? Because of capitalism. Anyone who studies capitalism and is familiar with, for example, the aging wine problem or the harvest timber problems that are using simple differential equations knows that when a natural resource starts to become scarce what happens to its price? It would increase dramatically, that would create the same incentives human beings have always faced from the time they were burning wood to when society was focused around coal, which caused the shift to cleaner energy, because as you know oil is infinitely cleaner than burning coal. So there has been an evolution of energy usage and natural resource usage as the technology improves but that should not be driven by fear that should be driven by people making choices, recognizing externalities, negative externalities as well but by developing technology that we, for example, have an inexhaustible supply of nuclear energy. It is thoroughly inexhaustible and it's the cleanest form of energy when it's done properly. There is nothing cleaner.

MF: What do you think about the waste of nuclear energy?

INTERVIEWEE: That has to be something which is addressed concurrently. I am very confident in the ability of scientists and engineers to deal with this issue. You know, over time I think that if you set up a challenge they look to meet it.

MF: So you think technology will solve the problems? Increasing technology?

INTERVIEWEE: Hasn't it always? Isn't the automobile one of the greatest pollution fighting mechanisms ever developed? If you looked at the cities 100 years ago, a little more than 100 years ago, would you find them more polluted or less polluted than they are today? They are far more polluted because of the horse and carriage system that was in post. Horses are nice animals but they produce a lot of waste. And when they die in the street they produce things like diphtheria and other diseases. And if you look at your brown stones, in Brooklyn especially, you'll see that there's a parlor level where the servants usually slept and lived and the other people lived further up, why? Because the stink was so bad and the garbage was so bad on the street level that they had literally no choice but to make that accommodation. Everything has to be seen within a historical perspective. History didn't begin in 1990, it began before that and that means that the car and aggregate has lowered pollution on the planetary level. The adjustment to cars that are rational, and I don't mean electric cars at this stage or cars that are engineered with 12 speed transmissions so that they can get 55 miles to their gallon in the future based on federal guidelines, cars that are rational that match the price of oil in their design in the sense that oil is cheap, you can use more oil. And if oil is more expensive and if there is damage being done to the environment from it then it should be taxed based on the amount of damage that it does but people should still be free to make their own choices. The biggest problem I see in the United

States now is not the environment, it's civil liberties that are being eroded and it seems like if Democrats do that that's perfectly acceptable but if Republicans do it the progressive movement becomes enraged. So I don't hear any talk about the NSA spying, about violation of civil rights of political organizations, and of individuals of selective prosecutions by the justice department. This is what worries me, this is what I see as a dark future for this country not the fact that I won't be able to breathe clean air or have pure water.

MF: So speaking about businesses, do you think that they should be held accountable for their pollution or any other environmental externalities?

INTERVIEWEE: They have to be held accountable for it. On the other hand I thought that they were. There's so many regulations that have been passed by the EPA encouraging businesses to install scrubbers on smokestacks, receive tax credits for implementation of more environmentally friendly technology and pay fines if they are dumping in effluence which are illegal to dispose of in a certain way that they are disposing of it.

MF: Do you think these regulations are beneficial?

INTERVIEWEE: To an extent they are but to the extent that they are bureaucratically enforced no. I think that they raise the cost of business and you have to regulate with a light touch. For example, rather than punish businesses that pollute you can offer a generous investment of tax credit, an ITC type of policy on businesses that install cleaner technologies. But that has to be with the realization of people who care about the environment that these cleaner technologies should also be more productive and efficient.

MF: So you're maybe pro cleaner technologies but in an efficient manner?

INTERVIEWEE: Absolutely. Who wouldn't be?

MF: Okay, but right now you don't believe they are efficient?

INTERVIEWEE: No I wouldn't say it in a blanket way. There's been plenty of success stories such as what's happened in dry cleaners and such as what's happened with the reduction of sulfur dioxide, so called acid rain, as a result of cleaner technology used by utility companies. So there have been a lot of success stories, there's also a lot of discouraging news about companies that are not locating to certain parts of the country because of the cost of the environmental impact they might have and this creates a job problem. So one of the things you do in economics is you check on how things are interrelated and you realize you just can't keep pushing one thing, you have to say what am I gaining, what am I losing? At the most basic level you want to have some type of metric where you gain more than you lose. So if you say to me you want the environment to be cleaner, I would say fine what's the cost of that? And if there are different ways of achieving the same result I would choose the most cost effective way of achieving it?

MF: So kind of like a cost benefit analysis?

INTERVIEWEE: Yeah, exactly, I mean isn't that what economics is all about? It is marginal benefits and marginal costs being compared. And that's supposed to lead you to better decisions and it also prevents you from violating the rights of others. Now if you dirty the environment and

you aren't held accountable for that you are violating the rights of others. If you tell businesses that you can't do certain things based on dubious application of rules that are not well thought out, that's equally offensive to me.

MF: Now shifting into ... the concept of biological diversity... do you believe biological diversity is important? And what I remember from what you said is that we don't know too much about it.

INTERVIEWEE: ... I like biodiversity because I like seeing a lot of pretty birds and butterflies. Now in terms of importance, I think this is not a closed question, it's an open question. I mean biodiversity has a hedonic importance based on the fact that certain levels of diversity delight the human eye and the human mind. To experience nature in an aesthetic sense. ... There's a utility there, which anyone who has ever gone out in a national park or a forest knows that. Or a garden even. Beyond that biodiversity probably promotes processes that are essential for a well-functioning ecosystem. On the other hand, in economics we have a general belief that too much of anything is no good. And that nature generally agrees with that. For example, too much solar energy could be destructive, the right amount isn't, too little may be not enough. So what's the correct amount of biodiversity? I think nature knows how to answer that. Now when human beings intrude on an ecosystem that's an exogenous factor that nature though is very capable of compensating for at times. So the response might be, let's say, a reduction in biodiversity, let's assume that's the case even though I don't know that it would be it may increase biodiversity. What's the cost of that to humans as a species? And the answer is, I guess that's very hard to figure out. You have to work with people who are biologists who can explain the benefits of biodiversity and most importantly quantify them. If a species becomes extinct because of human activity I'm not necessarily going to mourn that species because everyday species become extinct and everyday mutations arise which are the foundation of new species. So that would happen without human intervention.

MF: Do you think human intervention is accelerating the process?

INTERVIEWEE: No, that's a great question that should be researched. In some cases you would think it would have to. If you have an area that is pure and pristine and then it's disturbed and becomes subject to construction and to housing development and to urbanization, you would expect that it would have to accelerate certain destructive processes as well. The question is how to limit that, and no I don't necessarily say eliminate that. For example, if you, correct me if I'm wrong, but if you tell me that there's something positive about mosquitoes, I'm not aware of it at all. I don't think any scientist has demonstrated that yet. So if you have a human process that leads to the extinction of mosquitoes I would be thrilled. But would be there less biodiversity? Sure there would be. ... But I'll give you an example, the polar bears have been pointed out in danger of extinction, the only people who don't know that are the people who monitor them and the polar bears because the data show polar bear populations are increasing and not being in danger of extinction and I've heard for at least the past 5-10 years that in the future there won't be any polar bears. These types of spurious arguments, they are not helpful. Because when they prove inaccurate or it proves it's a cyclical process in their numbers that then reverses itself, it looks very bad on people who want to protect the environment.

MF: So it kind of decreases your trust in that process.

INTERVIEWEE: I think it would decrease anyone's trust because anyone who is rational would say show me the trade-offs. If the trade-offs are severe we don't want to ruin our future, of course. But don't point to something anecdotal and present it as a fact, which if you disagree with it leads you to be mocked. Among all the groups I see the most disrespectful are environmentalists. They seem to think anyone who disagrees with them is some type of fool or an idiot or someone who just doesn't care about the environment. And that's totally wrong and totally unfair.

MF: From what you study in economics do you believe that consumption patterns increase? And if so, will the increase be in the affluent or developing countries?

INTERVIEWEE: I hope they're both. I think consumption... See only Marxists have a problem with consumption because they talk it into themselves, when they're right, that there are inequalities which make consumption differences offensive and to me that's someone who was raised poorly. Because one of things I was always taught as a kid growing up, don't count your neighbors money, work hard and develop your own. You'll see people who are worse off than you, you'll always see people who are better off than you. But consumption to me is not an evil thing because I respect human beings. I don't think they are the complete idiots that Marxists make them out to be. I think that if someone has a goal that they want to live in a bigger house and they want to have three bathrooms instead of two, I don't think there is anything wrong with that. I think they should be encouraged, all the more power to them. And I think that it is not a zero sum game when it comes to consumption patterns. A rising tide, although it's been used a lot, rising tide lifts all boats. And if that's the case I'm hoping that there will be more consumption in all countries in the future. In other words I hope all GDP grows and I hope that reaches as many people on the planet as possible.

MF: Just for my own curiosity, do you believe that consumption is specifically, in the developing countries, do you believe that will raise them out of poverty?

INTERVIEWEE: It has to. Isn't every problem that they have in developing countries related to lack of consumption? If you're hungry you're not consuming enough food, if you're cold you're not consuming enough warm clothing. If you don't have plumbing, indoor plumbing, you're not consuming enough housing services. If you're sick you're not consuming enough medical services. I'd say any problem of that sort, unless it's deeply psychological, is related to lack of consumption on the most fundamental level. Maslow's hierarchy, right? You want to at least achieve your foundation and more so, so to me it's all about consumption. And consumption is good. Now you can point to ridiculous things in consumption, like Al Gore's mansion, like the fact that Bloomberg, instead of flying first class on a schedule airline needs to take a corporate jet. And god knows it causes how much pollution to give a lecture on why pollution is made up right? You can point to all those things, but you know what that doesn't bother me. It only bothers me if people like this try and legislate other people to follow what they don't themselves follow, that bothers me enormously.

MF: Yeah... the other night my friend and I went out and I told her, I had a water bottle, and I refused to put it down on the street and she goes “why don’t you just put it down?” and I said “well if I don’t do it, no one will do it”. I can’t expect other people to do it if I don’t do it myself. So I totally understand where you’re coming from, I try to not be so hypocritical.

INTERVIEWEE: You’re living your life based on what you believe and you have every right to do it. You have a right to engage people in discussion if they would want to do something similar. But you don’t have the right, unless you are in perfect information and knowledge of the situation, to tell people “I won’t let you put your garbage out unless you sort it and do this and that” and now I have to pollute more because of recycling. Because as you know the way Americans recycle; we pollute more! How’s that helping the environment? Is that a sign of rationality or insanity?

MF: If it was efficient, if it was a really efficient process, would you not have a problem with it?

INTERVIEWEE: How about if it helped the environment I wouldn’t have a problem with it even if it wasn’t all that efficient. But as an economist knowing that it hurts the environment, how do you think it makes someone who knows this feel like they can get a 1000 dollar fine if they don’t do what the government tells them to do. Does that give me the faith I need to say, well what other steps should we take to protect the environment? There’s no trust there now.

MF: A couple more questions, in my thesis I am talking about ... the impact of affluent countries and their impact on biological diversity, now I’m talking about it through specific materials, I call it, and so I’m doing it through consumption of meat eating, electronics such as computers or cell phones and motor vehicles. Do you have any comment on that?

INTERVIEWEE: No.

MF: Would you say that consumption is greater from different items than those? Do you believe that environmental degradation can even come from meat eating, like there’s no impact, affluent countries aren’t something to worry about, and or biodiversity isn’t even threatened?

INTERVIEWEE: Well let’s ask one question also. If affluent countries would buy into the full environmental agenda zealously, would that be enough to change anything if you don’t have developing countries on board?

MF: Are you asking me?

INTERVIEWEE: Well yeah.

MF: Oh, well that’s what I’m studying.

INTERVIEWEE: Well it wouldn’t be, because that we know already. Because which countries pollute more, affluent countries or developing countries?

MF: That’s also what I’m trying to answer.

INTERVIEWEE: You don’t have to it’s been answered in every economics textbook I’ve ever seen.

MF: And it's developing?

INTERVIEWEE: Absolutely. You visit Moldova, China, Syria, Cuba, Dominican Republic, Haiti, then you'll see real pollution, real tragic pollution. Now as society becomes more affluent people want to live longer and they want to live healthier. So they are willing to sacrifice for some level of environmental protection which they consume in the form of better quality in a longer period of life. But if you're struggling and day to day survival is in doubt then you just do whatever it takes, then you don't become environmentally aware. So the whole idea is to raise the standard of living and cause technological development to occur so that poor countries that are burning low grade coal and are involved in mining processes and extraction processes that are extremely damaging, including logging and other things, will turn towards other types of industry, which are less polluting, and other types of urbanization formats which are less polluting as well, or more sustainable as well. So you don't really need to convince the affluent world. I think that's been done already. Not by 100% but enough that the lifestyle of everyone's been changed because of the environmental movement. The question is now how far does it go? And if you want to really save the planet, if the planet needs saving you got to go to the developing countries and you got to integrate them to a global system, which promotes trade, technology, development, knowledge transfer, and also greater levels of environmental awareness.

MF: Something I just wanted to comment on really quickly, you said that affluent populations do know about their...? I'm not sure if I'm saying this wrong but they do know about their pollution? Is that what it was?

INTERVIEWEE: No, in other words affluent populations they want to reduce their polluting activities to an extent because it's in their self-interest to live a better quality life and a longer life for themselves and future generations. Not totally but significant amount of the population.

MF: Now when you say pollution, what type of pollution do you mean?

INTERVIEWEE: Any and all pollution that is inefficient and unnecessary.

MF: Would it be like "I'm going to throw away this thing from my desk" or is it "I'm going to stop consuming those certain products because in this other country it's causing issues".

INTERVIEWEE: I'll give you an example. I'm drinking this bottle of water right now which I'm really enjoying, right? There's some commercial running on TV that says if you take all the disposal bottles of water and you put them next to each other, it would circle the Earth so many times, right? I hope that's on the comedy channel because I don't give a damn about that. What's the alternative to me not drinking this? Maybe carrying my own bottle. What's my marginal impact on the environment of doing that? I would say very low. But let's make believe I have a higher level of consciousness and everyone did that. Would that change the environment in a positive way greatly? And I'll say no, there's no evidence that it does and until then I don't buy into it. And it increases my inconvenience, my costs of transacting. I don't think of it as a zero sum game. I think environmentalists are primitive creatures as intellectuals and the reason is every bit I consume imposing a cost on you that may be true, it may not be true but it's not self-

evident. Every evidences that increase consumption creates attention to cleaning up the environment so we can enjoy that consumption now that we've reached a greater level of baseline existence for the average person. Again, I think if you look at the source of different effluence you will see that the major problem is not with the developed world, it is with the developing world and as you know I go to China frequently, I've made about 20 trips to China. I've gone all over the country, although nowhere near as much as I'd like to travel and I've seen very beautiful, pristine, natural preserves and I've seen horrendous levels of pollution, sickening levels of pollution. And China has of course ... 20% of the world's population, so if you don't bring a country like China on board and they continue to pollute, that's a big problem.

MF: I'm going to be going into a completely different monster here and this has nothing to do with my thesis but just out of my curiosity, do you believe that the population is an issue?

INTERVIEWEE: Not at all, well I have to clarify that, because if we're talking... Population is an issue in some countries. See population is not a global issue, population is a geographic issue. So if you have countries that have very, very high birth rates, and their population is growing so quickly, literally they can't feed themselves.

MF: I, in my head, think of China and India.

INTERVIEWEE: China wouldn't be the case, it was the case in the past but the Chinese agriculture has made a lot of strides. You have to remember the first thing that was removed from Marxist ideology in China, in the business sense, was their agriculture. Cause China had the biggest famine in modern history, 40 million people starved to death there in the Great Leap Forward in the 1960's. So Chinese know about starvation and hunger so they've taken special efforts in those areas. Chinese were exporting foods to African countries while their own people were dying. They were literally chipping the bark off trees and boiling it in soup. And still till this day in China they eat insects, and by the way they are very good. And I can also tell you it comes from the fact that anything that moved, that was organic, was considered as a potential food source. Now is population a global problem? No! You can triple, probably even more than that, the global population. But it has to be spread out in a way that's rational. And a lot of countries that are poor, one of the first things you need to do to reduce your level of poverty is to reduce your birthrate. You've got to lower the birthrate. And that's not hard to do. One of the things you start with is you bring in cable TV. Give people free cable, right away they have an alternative then to the Friday night follies. And in the end you can watch the spread of cable TV and literally watch in real time the birth rate drop in the rural areas. Some of the programs are good, what can you say!

MF: My next question, and this comes from a professor... what do you think of sustainable development?

INTERVIEWEE: I think it's a bullshit term.

MF: Can you define sustainable development for me?

INTERVIEWEE: Probably you can do a better job than me but I would say when I hear people talk about sustainable development I believe what they are trying to express is the idea that

society, including economies, can develop without an increase of destructive processes that damage the ecosystem and the environment. That's why it's sustainable. Because you're not going to have a price tag that you have to pay in the future because you are developing more today. That price tag would be environmental emergencies or severe problems. Why do I think it's a bullshit term... I think it's a politically correct term that people don't have a clue about. To me it's like saying, let's come up with another term, intelligent economic development that sounds good too. What does it mean? I can maybe give it a definition, right? Does it matter? I mean something that is sustainable, by definition, is bad because it means that it can't evolve and it's a dinosaur from day one.

MF: That's what you think?

INTERVIEWEE: Absolutely!

MF: Okay, I just wanted to clarify.

INTERVIEWEE: I don't want to see the ecosystem sustained, I want to see it improved! I want to see resources be used more efficiently, in many different dimensions. When you use a buzz word like 'sustainable development', I'm afraid what happens is that you weaken yourself politically because you say either it's sustainable or not. Life isn't like that. Sustainable is good, non-sustainable development is bad. We don't like to think in terms of good or bad in economics. ... We're not moralists, we like to think in terms of trade-offs. So I don't think that one type of development works, one size fits of all and that how Philadelphia wants to develop their electric grid is necessarily going to be the way that Phoenix has to develop its electric grid, given differences in temperature, precipitation, environment, preferences, urban density, and things like that. So sustainable development, to me, is another attempt to create a cookbook and if you follow the cookbook you're rewarded because you're politically correct and if you don't follow the cookbook, you're some kind of kook, a wacko who doesn't really want to honor the environment or the planet or preserve it in a good way. So far better than sustainable development, I believe in intelligent public policy and that's where you define goals. You define goals recognizing that the group that's seeking political change is not the only group on the planet and you look at what constrains you at the moment, what politically, financially, technologically, and then you weigh your benefit and costs and you do an honest job. Sustainable development creates another catechism. It's amazing, you have so many secular people in the environmental movement and they pine for the good ole' days where they can go to the local priest and say "guide me, what do I do?" It's like bleeding sheep, if you want to have true global impact, you have to work globally and you have to take into account competing stakeholders. Now this should be something that's possible to do and I don't see why it isn't possible to do.

MF: Yeah, well when I think of what your definition of sustainable was, kind of not really going anywhere, just sustaining something, something that helped me was when I took a class last semester; I learned a true difference between development and growth that was kind of funny. I usually say: my brother, he's 18, he's done growing, but he still needs to develop. That's how I think of it.

INTERVIEWEE: To me all that's bullshit and I'll tell you why. It's rhetorical, it doesn't lead to better policy. It makes people feel good. Oh we're going to move towards better sustainable development rather than just economic growth. What does that mean? And then people say "Oh economic growth could be bad because it hurts the environment." Sustainable development takes the environment into account, beautiful. How many angels can dance on the head of a pin? Is it two million, ten million, or infinite? Why don't we have a debate about that and we can define different types of angels who can fit on the head of a pin? This is wasting time, wasting time completely, it's complete nonsense, it develops a vocabulary that people who are already of a like mind embrace and it's useless to dealing with business groups and other political and special interest groups who need to come on board if you're going to have a rational public policy. That is not based on intolerance and believing someone that professes environmental concern to being morally superior to those who don't emphasize it to that extent. It's not helpful. It's only self-aggrandizing, that's all I see it as. And a perfect example of that would be the program at Columbia. They have an economics department and they offer a PhD in it and then they have a program in sustainable development and they offer a PhD in it. So my answer to that is very simple. If you have two different departments, it's insane, that should be one department. All it says is that people who believe in sustainable development are having trouble talking to people who want to carry out rigorous economic debate.

MF: So you kind of think that they should be related...?

INTERVIEWEE: How will you accomplish anything broader, anything that really is helpful if you don't have the input of the individuals who have to effect the change? How would you do it? I don't know.

MF: So you believe that technology and efficiency is our future?

INTERVIEWEE: No I don't believe that. I think the environmental movement underrates that. It's actually, they are luddites, they are technophobes. They like using cell phones and they like wireless internet and they like wonderful medical advances, and they don't realize that technology is not a demon. We are not creating Frankenstein here, Frankenstein is our literature. The same technology that admittedly created the bomb also created antibiotics, which have saved a lot more lives than nuclear weapons have killed. Technology is not a bad thing, it's something that should be embraced, embraced to the extent that it carries progress forward. I mean, did we have any progress before the Industrial Revolution? We went through 15-16 centuries of lack of progress, is that we're going to go back to? But instead of worshipping at the foot of the church we should worship at the foot of politicians? Who promote their own interests and solidify their support by using lightning rod concepts like sustainable development? Are people really that stupid that they believe that these are their priests leading them? I care deeply about the environment. I believe in conservation. I think Teddy Roosevelt had a very pragmatic American attitude towards the environment and I learned a lot by reading his writings. But I've read a lot of older material, older material relative to today, I mean stuff that came out in the 60s, 70s, 80s and 90s that would never be published today because they are just ludicrous scenarios.

MF: In what field?

INTERVIEWEE: The field of environmentalism, the sky is falling, little chicken little running around, warning everyone doing its poor little noble job.

MF: This is the last ... question. This comes from the same professor... do you think that artificial or human made capital can substitute for natural capital? And he defines natural capital as maybe ecosystemic services, air, water. Do you think that human made capital can substitute for those things?

INTERVIEWEE: I'm not sure I understand the question.

MF: Well I think he's trying to say, his point of view, would be that you could not because you can't replace air, and the example he uses frequently is in Australia there's an ozone hole, the hole in the ozone layer above Australia, and so should we create a technology that people could wear to reflect those lights, or should we work backwards and fix that ozone layer and fix the problems that actually create it instead of just continuously creating more ozone holes, holes in the ozone layer...

INTERVIEWEE: Obviously it's a self serving argument. Obviously if you can stop a problem at the source it's much better than correcting the side effects that are already highly detrimental. It's also less expensive to stop it at the source but not so sure that the question is... See all capital is artificial...

MF: He's saying natural capital, like water and air...

INTERVIEWEE: So natural resources... So can capital substitute for natural resources?

MF: Yes, I guess that's what his question is.

INTERVIEWEE: It's a good question. I would say yes it can. I'll give you an example of how it can be done. An artificial heart. You consider the heart a natural resource at one point in time and now you have the technology to build better artificial hearts or actually print hearts using 3D technology, which is what's being worked on now, which I think is wonderful. And that's a substitute for a natural resource in a sense. Now for air, you could also substitute, if you're an environmentalist you would want a substitute. You would want to substitute sometime of capital technology equipment that would need less air to produce some type of product or service so it would be less polluting. So I would say that's part of the goal is to, again, not view things as a zero sum game. A zero sum game is that you have a limited number of natural resources, you have a limited amount of capital, you have a limited amount of labor and these groups suffer, or these entities or sets suffer when one group, one entity advances, must be at the expense of the other. Some say good business, good public policy, good industrial policy, since that's not what we should be doing. We should be looking to use what we have, develop technologies that don't exist that will alleviate some of the problems. Another good example would be techniques of drilling for oil that are less environmentally dangerous. That would come from development of new technology. Now I prefer than to someone say "you can't use as much oil". Now what's the logic here? If I can't use as much oil I have to cut back on consumption. Who's cutting back on

the consumption? Is it me or is it you? And how do we decide? Because obviously the leaders of the environmental movement don't want to cut back, and I don't blame them, I'm just fascinated by the level of hypocrisy. That's all. So that's how I feel. But on the other hand, certain types of natural resources, I believe are finite and irreplaceable. I think that to me that seems a strong conclusion. For example, how do you make water? You discover sources of water, aquifers, and you clean or desalinate water or process water. But I don't think you can fundamentally transmute matter. Not at this stage in our society. The fact that natural resources are finite and need protection and that government has to be involved, there's nothing I can argue with. I question the extent and I question any form of extremist belief. And I do see myself as a nature lover. I love all animals. And I am a hypocrite because if it was up to me and I was living on my own I would have to be a vegetarian because I would never be able to kill even chickens or ducks or cows because I love all these animals and I think they are adorable. I take advantage of the society services that I'm living in. On the other hand I fully admit it that I would not, on my own, slaughter these things, I would limit that to however I could and I would look towards alternatives. But I don't even like, I don't know that plants don't have feelings. But you have to do trade-offs, there's processes that show life and death in an ecosystem and I guess that's natural. But I'm a hypocrite when it comes to... even an alligator! I wouldn't bother an alligator. Why? To wear alligator shoes? A buckle, a belt? I would leave the alligator alone. I would say you do your thing and I'm happy you're doing it cause you're not eating me.

MF: Just your opinion... do you have any advice for me while I write my thesis?

INTERVIEWEE: Sure! Take as an objective position as you can. I remember when I was writing my master's thesis, for example, I had very strong beliefs about it, but for me it was more like...

MF: What was your master's thesis on?

INTERVIEWEE: It was on the impact of ideology versus economic interests in a particular set of votes that occurred in Congress which transformed the banking industry in the United States. Specifically the Bank Company Holding Act of 1956 and what was called the Douglas Amendment. So I built a model that tried to explain why the legislators voted the way they did. They vote their ideology or do they vote their constituents interest, or do they vote an interaction of the two? And I had an idea of how it could turn out but I viewed it as an experiment and until I saw the results on different computer runs of the model, I didn't write the conclusion ... I looked at the results and tried to explain them as best as I could. A lot of the results were in agreement with what I had predicted, some were not. And I think that's learning, that's knowledge. So when you're surprised at your own results. And I'll give you a fast example about it. One of our students who just won a very nice award to present at the Dallas Federal Reserve Bank did a research paper on the impact of the affordable care act on adult dependent children usage of medical resources. So that means you can go on your parent's plan until you are 26. You're an adult dependent, you're a child. If you do that, would you use more medical resources or fewer medical resources, or it wouldn't matter? Now what would you say, if you were just trying to be a predictor? Would you say that if you could only be covered by going on to your parent's health plan, you did, would that affect your decision on how much medical resources you would...?

MF: I would personally wouldn't, I wouldn't use it more and I wouldn't use it less. I would use it as I had been using it.

INTERVIEWEE: A neoclassical economist would predict that the cause, you can get coverage without having to pay for it out of your pocket, it would be used more. And that was my prediction. The student used data that was not related to the affordable care act, it was based on a Brookings Institution's study that was done in the 90's. And it replicated it as an actual experiment. What they found was that there was no impact. And I was very surprised and the student looked at me as if "are you upset by this?" How can I be upset? You are trying to find out what's going on. It's counter intuitive to me, I want to see some follow up, but it may be an example of something that I believed about Obamacare but it's not true! That's why we're here. To find out what's true and what isn't. Keynes, the famous economist, when I find out I'm wrong I change my opinion. What do you do? I'm always open to new ideas and I said to my ... that's fantastic research and I'm going to Dallas to hear the presentation. I think that is what learning is all about.

MF: Is there anything else you want to say? A concluding remark?

INTERVIEWEE: I think if environmentalists take non environmental problems seriously, such as job creation and the need for people to increase consumption because it's their right to do so. And I think if people who distrust the environmental movement are able to see that policies are discussed with some attempt to promote efficiency unless distribution, you would be surprised about how much you can accomplish.