Biodiversity Loss and Climate Change:

An Eco-Social Analysis

By

Daniel Church

A Thesis submitted to the Faculty of Graduate Studies, University of Manitoba in Partial fulfillment of the requirements of the degree of Master of Arts

Department of Sociology,

University of Manitoba

Winnipeg, Manitoba, Canada

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

*****

COPYRIGHT PERMISSION

Climate Change and Biodiversity Loss: An Eco-Social Analysis

BY

Daniel Matthew Church

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of Manitoba in partial fulfillment of the requirement of the degree

MASTER OF ARTS

Acknowledgments

I would like to thank my thesis advisor, Russell Smandych, for his excellent mentorship and guidance throughout all stages of the thesis process, and committee members Mark Hudson and Ian Hudson, for their superb insights, support and assistance in bringing the thesis to completion.

I would also like to thank Margaret Currie for her invaluable help without which the project could never have been completed.

Finally I would like to thank and acknowledge the Social Sciences and Humanities Research Council for the Joseph-Armand Bombardier Canada Graduate Scholarship, which provided the financial support and funding that allowed this research to be conducted.

Dedication

I would like to dedicate this work to Karuna Sharma, my beloved wife and best friend, without whose love and support I could never have made it this far-

and to Sequoia sempervirens Hyperion, and all its relations.

Table of Contents

Contents

Introduction 1
Chapter 1: Climate Change and Biodiversity Loss 6
Chapter 2: A Case Study of the Tar Sands 18
Chapter 3: Theoretical Perspectives 24
Chapter 4: Methodology 44
Chapter 5: Finding the Causes 46
Chapter 6: Applying the Theories to Generate Solutions 56
Chapter 7: Solutions to the Global Ecological Crisis 84
Chapter 8: Summary and Conclusions 113
Works Cited 139

Abstract

This thesis analyzes the global ecological crisis. It divides the global ecological crisis in to two major components: Climate change and biodiversity loss. Using a theoretical methodology based on comparing and applying a variety of lenses from within environmental sociology, the thesis asks and answers two questions: What are the causes of the global ecological crisis, and how can we solve it? Drawing on the perspectives of ecological modernization theory, ecological Marxism and deep ecology, the causes of and solutions to the global ecological crisis are identified. The primary causes of the crisis are found to be inefficient industrial technology, capitalism and an instrumentalist and anthropocentric view of the natural world. The primary solutions, therefore, must include a widespread shift towards clean and green technology, a transformative social revolution, and a new ecocentric respect for the intrinsic value of non-human life. The study offers many recommendations for policy makers.

Introduction

The contemporary world is charged with an atmosphere of "anxious uncertainty, which seems to animate much of the public discussion on planetary futures today" (Stoett 2012, xi). This anxiety is borne out of a growing awareness that "fears of cataclysmic events- ones related both to climate change and to more natural disasters- are certainly ripe" (Stoett 2012, xi). So pervasive and existential are these environmental anxieties that they may now "be compared to the fear of nuclear annihilation that marked the cold war period" (Stoett 2012, xi). Unfortunately, these anxieties are not exaggerated or unfounded, as there is now an overwhelming scientific consensus that the planet Earth is confronted by an ecological crisis of massive proportions, one that jeopardizes the survival of both human civilization and the majority of plant and animal life (Sachs 2008, Korten 2006).

Indeed, "the empirical evidence that there are multiple and interconnected environmental crises and that human communities are threatened by their culminated impact is rather incontrovertible" (Stoett 2012, 3). It cannot be overemphasized that "a large and growing body of evidence—representing the majority of experts across academic fields—has demonstrated that we are in the midst of an ecological crisis. While it is impossible to pinpoint the exact date of the "endgame" or tipping point, there is no doubt that we are facing a period of profound instability" (Brownlee and Kuneman 2012, 59).

It has been observed that "so profound are these issues that the most prevalent cultural motif today...is that we are in collective trouble, and this theme is reflected in a postmodern planetary anxiety, which engulfs much of the public thinking about our collective future" (Stoett 2012, 2). Clearly, understanding the causes of this environmental crisis and formulating effective responses to it is the most urgent and crucial task that has ever faced humanity. Recognizing that "social and economic change is needed to redirect human conduct towards a way of life that exploits fewer resources, produces less waste, and uses radically different consumption and distribution practices", we must proceed with the task of analyzing the ecological crisis in order to discern precisely what form that social and economic change must take (Brownlee and Kueneman 2012, 59). For the analytical purposes of this research, the global ecological crisis will be divided into two major components- biodiversity loss and climate change. The goal of this research is to apply the theoretical perspectives of environmental sociology in order to answer two key questions. First, what are the causes of the environmental catastrophe confronting us? And second, what must human society do in order to not only survive this crisis, but also repair the monumental damage that has already been done?

Using the methodological approach of qualitative documentary analysis, this thesis asks and answers to main questions. First, it assesses what the major causes of the global ecological crisis are, and second it explains what the best solutions to the crisis will be. In order to do this, it applies three major theoretical perspectives: ecological modernization, ecological Marxism and deep ecology. Ultimately, it concludes that the primary causes of

the global ecological crisis are human population growth, excessive consumption on the part of the rich, outdated and inefficient industrial technology, problematic economic structures, the rapacious system of capitalism and an instrumentalist and anthropocentric view of nature. It concludes that the best solutions to the global ecological crisis include widespread adoption of clean and green technology, a transformative social revolution, measures to reduce population growth, measures to constrain unsustainable levels of consumption and a new worldview that respects the intrinsic value of non-human species. These goals will be pursued through the major strategic approaches of state environmental regulation, environmental activism, environmental internationalism and green consumerism.

Human activity has dramatically and rapidly decreased the livability of the planet Earth, with the consequence that the very survival of the species has now been called into question (Bauman 2001, 187). As a result of the catastrophic erosion of ecosystems and the resulting degradation of vital natural resources such as fertile soil, fresh water and clean air, humanity is now confronting a global environmental emergency of apocalyptic proportions. The survival of our species now depends on our ability to make extremely rapid and radical adjustments to the changing environmental conditions of our planet-adjustments that will prevent further ecological harm while repairing the monumental damage that has already been done. This task is particularly urgent, as at present we often "seem to be standing still, like frozen passive-aggressive witnesses to our own demise" (Stoett 2012, 2). The first step to breaking through this paralysis is truly understanding the crisis. To that end, we can begin by identifying that the planetary environmental crisis

has two primary aspects or facets: climate change and biodiversity loss (White 2010, 4). These two interrelated crises exacerbate and feed in to one another, and taken together they pose an unprecedented threat to society and the human race.

Jared Diamond (2005) has argued that our society, like so many before it, is heading for collapse. The primary driver of that collapse will almost certainly be ecocide. Ecocide is a key concept in this analysis, because "ecocide has now come to overshadow nuclear war and emerging diseases as a threat to global civilization" (Diamond 2005, 7). Therefore, "the post-cold war era has not been free from the existential fears of previous generations who were made to hide under school desks in futile nuclear attack drills. If anything, the angst is sharper today because of the gnawing feeling that we could, should, must do more" in the face of the "rampant ecocide that now threatens all future generations" (Stoett 2012, 2).

Ecocide is defined as the systematic destruction of ecosystems and the extermination of non-human species. However, ecocide also means "unintended ecological suicide…people inadvertently destroying the natural resources on which their societies depend" (Diamond 2005, 6). Therefore, ecocide refers to the set of processes by which humans are systematically eroding the very planetary life support systems on which their own existence relies.

The purpose of this research is to understand the challenges of the global ecological collapse and to devise strategies which allow us as a species to "avert the most dangerous

trends of climate change, species extinction and destruction of our ecosystems" (Sachs 2008, 6). A major premise of this thesis is that the current challenge facing humanity, that of restoring the life-support systems of our planet even as they collapse around us, is the greatest and most important challenge that humanity has ever faced, one that will quite literally determine the future of all life on Earth.

My hope is that the reader of this thesis will learn a great deal about the ecological problems that confront our species, and will also learn that "there is much being done at both the international and local levels" and much more that can and must be done (Stoett 2012, xii). Therefore, although it will not shy away from the grim realities of global ecocide, this thesis does not accept the "notion that we are helplessly watching the advent of a disaster" (Stoett 2012, xii). On the contrary, it will argue that "we need to replace relentless uncertainty and helplessness with firm, educated resolve" (Stoett 2012, xii). This research will present numerous "positive steps, rooted in nuanced understanding…to make things better" (Stoett 2012, xii). Therefore, "there is cause for restrained optimism", and I hope the reader is left with an encouraging sense of hope, determination and resolve- to meet and overcome the environmental challenges that we face. Moreover, I also share Stoett's (2012, xiii) hope that readers of this thesis will "seek more knowledge- and take personal steps towards a greener lifestyle and a more humane world".

Chapter 1: Climate Change and Biodiversity Loss

This chapter presents an introduction to, and preliminary analysis of, the two primary facets of the global ecological crisis. The first aspect of the crisis is climate change, and the second is biodiversity loss. Both will now be explained in detail.

Contemporary anthropogenic climate change refers primarily to the rapid rise of planetary temperatures as a result of the atmospheric accumulation of pollutants emitted by human practices of transportation and production. However, both record high and record low temperatures have been experienced in particular locales and a general destabilization of climate patterns and intensification of weather events are as much a part of climate change as general warming. These atmospheric pollutants, sometimes referred to as greenhouse gases, trap solar heat in the atmosphere resulting in a warming global climate. There is a strong and growing consensus that "global warming is a threat to life on earth and is caused by the increasing atmospheric accumulation of carbon dioxide, methane, oxides of nitrogen and chlorofluorocarbons" (Marsden 2007, 126). The control of these greenhouse gases has arguably become the foremost environmental challenge facing humanity today (along with the related issue of atmospheric ozone depletion) and climate change is already affecting the health of children and putting the future of coming generations into jeopardy (Heesterman and Heesterman 2013, 1).

Global warming is anticipated to have at least six major catastrophic effects on human life. These are: 1. massive displacement of human populations as glaciers melt and sea

levels rise, resulting in the flooding of coastal cities and the uprooting of "hundreds of millions of coastal dwellers" (Homer-Dixon 2009, 18). 2. A drastic increase in the scarcity of fresh water as lakes evaporate, rivers dry up and freshwater aquifers are destroyed by salinization from rising oceans. 3. Increased rates of starvation and food scarcity as water for irrigation becomes rare and "shifting weather patterns…turn the world's breadbaskets into dust bowls" (Homer-Dixon 2009, 18). 4. An increase in the frequency and severity of lethal heat waves, extreme climactic events and natural disasters. 5. An increase in social conflict and military violence, as geopolitical pressures associated with "climate change will help produce…violence in the form of insurgencies, guerrilla attacks, gang warfare, and terrorism that is diffuse and chronic" (Homer-Dixon 2009, 19). 6. Increased spread of infectious disease, as "rising temperatures are bound to contribute to an increase in cholera, diarrhoea and malaria" (Clarke 2008, 62).

For the global ecosystem "human pressures on the Earth's… climate, unless mitigated… will cause dangerous climate change, massive species extinction, and the destruction of vital (ecosystemic) life support functions" (Sachs 2008, 6). The ecological consequences will be numerous and in many cases disastrous. For example, "global warming will raise ocean temperatures and lead to massive coral bleaching, in which the corals expel the micro algal organisms that give the corals their dazzling colors, and die" (Sachs 2008, 74). Coral reefs are among the most ecologically rich and biodiverse environments on earth, and their destruction will be disastrous for marine species.

Although the worst consequences of climate change are no doubt still looming on the horizon, significant "climactic damage… has already occurred, (including) droughts in East Africa, flooding in Bangladesh, (and) flooding in Southern Germany" (Heesterman and Heesterman 2013, 17). Furthermore, the health and life chances of children in the developing world have been severely threatened, melting of the arctic sea ice has exceeded even the most pessimistic expectations, and the Earth's surface has heated by one degree centigrade since the mid-1950s (Heesterman and Heesterman 2013, 17). Sadly, "in all probability it has already caused irreparable damage, which is likely to become worse" as "the consumption of fossil fuels and more generally the creation and use of industrial products is a basic characteristic of our society" and "this makes it extremely difficult to reduce emissions of CO2 and other greenhouse gases to a level capable of preventing their concentration in the atmosphere from rising even further" (Heesterman and Heesterman 2013, 17).

The severity of the negative outcomes associated with climate change is dependent upon the extent of the global temperature rise and the intensity of carbon saturation in the atmosphere. This is represented by the notion of climate thresholds, levels of change that differentiate apocalyptic global warming from warming that is 'merely' disastrous. Many "climate scientists agree that the critical threshold for temperature rise on the planet is two degrees Celsius above pre-industrial levels" and hope that "holding global temperatures at two degrees Celsius above pre-industrial levels...would be sufficient to bring global warming under control", thereby averting the worst outcomes (Clarke 2008, 61).

If, on the other hand, carbon emissions are not brought under control and temperatures rise above the two degree threshold, experts predict that we will pass a point of no return, beyond which "major ecosystems on the planet will begin to collapse (and) start releasing greenhouse gases instead of absorbing them...At this moment and beyond climate change will be out of our hands and accelerate without our help" (Clarke 2008, 61). The extent of temperature rise is also correlated with the concentration of carbon as measured in parts per million. In this case, "climate scientists generally agreed that 450 parts per million was potentially a critical threshold. Beyond that point, they argued, the biosphere itself could start to release massive amounts of carbon…(and) this would be the beginning of a slide to irreversible and perhaps catastrophic climate change" (Homer-Dixon 2009, 16).

Unfortunately, new research has suggested that previous estimates may have been too optimistic, and that the threshold of catastrophic change may in fact be considerably lower. Recently "a consensus has begun to emerge that the safe threshold is likely far below 450 parts per million" and "the lead climate scientist at NASA…has recently argued that the world needs to return to 350 parts per million" (Homer-Dixon 2009, 16). If this estimate is correct, the critical threshold may have already been passed as much as two decades ago.

Although specific predictions vary, all "models agree that the business-as-usual path of GHG emission trajectory will sooner or later cause a phase transition in the coupled atmospheric system, after which socio-political policy actions and behavioral changes by

themselves will not be adequate to stop run-away climate change" (Zia 2013, 11). This is because "the natural biogeochemical cycle would have degenerated to the point that reduction in anthropogenic GHG emissions would be inadequate to stop the global warming effect from playing havoc in diverse socio-ecological systems" (Zia 2013, 11). Curbing emissions in time to prevent this catastrophic threshold from being crossed is therefore an urgent and unavoidable component of human civilization's struggle to solve the global ecological crisis, and the urgency of the climate change crisis demands a rapid transition from carbon-intensive to sustainable methods of production and employment" (Heesterman and Heesterman 2013, 4).

Even if climate change can be kept below catastrophic thresholds, consequences for humanity and nature will be extreme. Even modest increases in temperature can have profound effects, and Clarke (2008) argues that "temperature increases of less than one degree above pre-industrial levels ... would trigger a decline in crop yields, the spread of drought within the Saharan region of Africa, a further deterioration of water quality and a dying off of coral reefs" (62). Meanwhile, "if temperatures rise by less than 1.5 degrees above pre-industrial levels, we can expect that an additional 400 million people will face water shortages, an additional 5 million people will go hungry, and 18 percent of the world's species will become extinct" (Clarke 2008, 62). It is abundantly clear, therefore, that responding to climate change is an extremely urgent aspect of addressing the global ecological crisis.

Some experts predict that "an even greater harm… might come from our interference

with ecological processes" in the form of anthropogenic global warming. This theory postulates that the end result of our greenhouse gas emissions may be nothing less than *mass extinction*. For example, Ward (2007) "has found historical parallels between previous mass extinction events and a strong rise in greenhouse gases. In the case of the largest extinction event, the Permian extinction of 200 million years ago… 90% of the species on earth and 97% of living beings were eliminated as a result of a massive atmospheric injection of greenhouse gases" (286). If human caused atmospheric emissions could induce a similar effect, the result could be a genuine apocalypse- the end of life on earth as we know it.

Biodiversity Loss

The second major facet of the global ecological disaster is biodiversity loss. This category is both a distinct environmental emergency and a direct consequence of climate change. According to White (2010), "biodiversity is generally defined as the variety of all species on earth. It refers to the different plants, animals and micro-organisms, and their genes that together make up life on the planet" (White 2010, 53). Contemporary biodiversity *loss,* therefore, refers to "the tide of species extinction and the overall reduction in species" as human destruction of ecosystems makes it impossible for other forms of life to survive (White 2010, 4).

Today "it is commonly understood that species are nearing extinction on a daily basis" and this the core of the issue of biodiversity loss (Stoett 2012, xii). In particular, "biodiversity is at serious risk from profit-oriented production methods and current

patterns of consumption" and the exacerbating factor of human population growth (Heesterman and Heesterman 2013, 1). What has become exceedingly clear is that global "business as usual threatens the collapse of high biodiversity ecosystems, such as the tropical rainforest zones" (Heesterman and Heesterman 2013, 164). Furthermore, "there are indications that (although) there are threshold levels up to which the system as a whole can cope… the next dose of strain may cause a complete collapse" (Heesterman and Heesterman 2013, 164). When we will reach that fateful point of no-return is unclear, but strong indicators suggest that we do not have much time left to stem the tide of species extinctions before the hemorrhaging of planetary biodiversity reaches a terminal stage.

In essence, the problem of biodiversity loss describes the human transformation of Earth from a planet that is rich with a vast diversity of life to a planet that is genetically impoverished. Few now doubt the "evidence of massive and planet-wide species extinction at the hands of human activity" (Sachs 2008, 13).

Tragically, we are witnessing "the extermination of the majority of non-human species as an unintended consequence of the overuse of the earth's resources" and the resulting consequences of "habitat destruction… collapsing fish stocks, destruction of coral reefs, irresponsible felling of tropical rainforests and overuse of water, to name but a few" (Heesterman and Heesterman 2013, 17). The Rio Convention on Biological Diversity has stated that "we are indeed experiencing the greatest wave of extinction since the disappearance of the dinosaurs" (Sachs 2008, 14). According to their estimates "every

hour three species disappear. Every day up to 150 species are lost" (Sachs 2008, 14). This "wanton plunder of other forms of life is heartbreaking, quite apart from the fact that humanity itself might come to harm as a result of extinctions of this magnitude" (Heesterman and Heesterman 2013, 17-18) Clearly, therefore "there is an urgent need to rectify the damage that is still being inflicted on the ecosystem, to find a human lifestyle that does not attack its own physical and biological basis" (Heesterman and Heesterman 2013, 17).

In order to measure the rate of biodiversity loss, "the World Wildlife Fund regularly publishes a Living Planet Index that tracks the health of the world's forest, freshwater, ocean, and coastal ecosystems over time" (Korten 2006, 59). This index provides a rough measure of the vital capacity and ecological wellbeing of our planet. Disturbingly, this index has "declined by 37% over the thirty year period from 1970 to 2000" (Korten 2006, 59). Biodiversity is the very fabric of life on earth, and this fabric is being torn apart. Although few species have remained unscathed in this global wave of mass extinctions, some have been hit especially hard. It is estimated that "amphibians face the greatest risk and coral species are deteriorating more rapidly in status" (Stoett 2012, 44). Overall, "the abundance of vertebrate species, based on assessed populations, fell by nearly a third on average between 1970 and 2006, and continues to fall globally, with especially severe declines in the tropics and among freshwater species" (Stoett 2012, 44).

One basic cause of biodiversity loss is the increased mastery of our environment afforded to human beings by our technology, combined with a lack of ethical respect and

recognition for non-human forms of life. In essence, "we have become so adept at clearing the ecological playing field to satisfy human desires that we are shoving the rest of life right off the stage" (Sachs 2008, 66). The industrial revolution has allowed us to remake the natural world in our own image, to the extent that Paul Crutzen has dubbed the current age "the Anthropocene"- meaning that "human activity has become the dominant driver of the natural environment" (Sachs 2008, 64). This ecological disruption has been so profound that "scientists estimate that extinction rates are 1,000 times higher than the background or naturally expected rate" (Millennium Ecosystem Assessment [MEA] 2005, 3). Critical dimensions of anthropogenic species extinction include habitat disruption, "extensive fragmentation and degradation of forests, rivers and other ecosystems" and "crop and livestock genetic diversity… decline in agricultural systems" (Stoett 2012, 44). Part of the problem is that humans barely understand the ecological systems that we have usurped, and in just over 200 years humanity has driven species to extinction at a rate not seen on Earth since the dinosaurs were wiped out by a great meteor.

When biodiversity is lost untold genetic riches are lost with it. For example, thousands of lifesaving medicines have been derived from chemical analysis of plant species, and yet "less than 2 percent of all plant species have been fully tested in laboratories" (Narby 1998, 38). Remarkably "the great majority of the remaining 98% are in tropical forests" such as the Amazon, which "contains half of all the plant species on Earth" (Narby 1998, 38). Yet as human agents clear vast swathes of rainforest in order to undertake activities such as cattle ranching, mining and oil and gas exploration, the rapid deforestation in

these areas is resulting in countless species "literally plummeting" towards extinction (Van Solinge 2010, 32). Another major driver of biodiversity loss is agriculture, particularly "monocropping schemes (which) are really testing the limits of the ecosystems. They are thirsty in water, fail to regenerate the soils and often result in an overuse of pesticides because the natural defenses in nature (thanks to the diversity of plants) are missing" (Heesterman and Heesterman 2013, 164). As a result of these sources of biodiversity loss, countless potential drugs, medicines and scientific breakthroughs will be lost forever, along with a great portion of the Earth's beauty and ecological robustness.

The rate of biodiversity loss is truly frightening. In the last five hundred years "more than 750 species extinctions have been recorded by the international union for conservation and natural resources" (Van Solinge 2010, 143). These recorded extinctions are only the tip of the iceberg however, as the vast majority of extinctions are not recognized by science, often involving the annihilation of life forms before they can even be identified and classified by researchers. E.O. Wilson "has estimated that up to half of all species… faces a threat of extinction during the twenty-first century" (Van Solinge 2010, 143). Driven largely by "habitat destruction, climate change, and invasive species" the planetary ecosphere has been plunged in to "the greatest mass extinction in history" (Stoett 2012, 44 and 43). What we are witnessing is the literal collapse of life on Earth within the course of a single human generation. There can no longer be any doubt that "we are witnessing, and indeed enabling, a catastrophe" (Stoett 2012, 44).

The Earth is experiencing a "rapid deterioration of biodiversity across the plant and animal kingdoms" as a result of factors such as "(human) population growth; pollution; global climate change; habitat destruction; over-exploitation of natural resources and invasion of introduced species" (White 2011, 58).

It is believed that "the greatest threat to biodiversity is habitat destruction, which has many linked causes: deforestation, desertification, intentional or natural flooding and fire, land conversion for agriculture or commercial development, the spread of pollution including oil and radiation, and the introduction (intended or not) of invasive species" (Stoett 2012, 36). Another major factor is waste and pollution, which runs the gamut from the "local and perceptible, such as oil spills, river contamination or the effect of lead from car exhausts… to the other end of the scale… the threats to the integrity of global resources, such as the ozone layer, the atmosphere and ecosystem" (Heesterman and Heesterman 2013, 161). All of these factors are pushing species to extinction at an unprecedented rate. Consequently, "the loss of biodiversity in all three of its main components – genes, species and ecosystems – continues at a rapid pace today and the principal pressures directly driving biodiversity loss… are either constant or increasing in intensity" (White 2011, 53). These trends suggest that future generations of humans will inhabit a world largely devoid of wildlife, a world in which the magnificent living richness and diversity of planet Earth is a historical footnote rather than a living reality.

The relationship between biodiversity loss and climate change is both direct and complex. This is because "the destruction of ecosystems and biodiversity are not only

reckless in their own right but also reinforce the CO2 content of the atmosphere... Climate change and acidification of the oceans with carbonic acid in their turn threaten biodiversity. They reduce capacity of the oceans to absorb CO2 in an augmenting two-way loop which again increases climate change. Rising water temperatures and incipient acidification of the oceans have led to large-scale coral bleaching with serious repercussions for marine biodiversity as well as grave implications for human health" (Heesterman and Heesterman 2013, 163). We must understand biodiversity loss and climate change as distinct but interconnected issues, each feeding into and reinforcing the other. Therefore we must search for solutions that address both problems simultaneously, and remember that although these two categories of global ecological harm cannot be collapsed in to one another, neither can they ever be fundamentally separated in analytical or pragmatic terms. Taken together, biodiversity loss and climate change are the two major faces of the global ecological crisis, and in order to solve either problem, we must solve both.

Chapter 2: A Case Study of the Tar Sands

We have now seen in general terms that the global ecological crisis has two primary facets- climate change and biodiversity loss. We have seen how serious these problems are, and what threats and consequences they entail for the human species and the planetary ecosphere. In order to ground this discussion and make it more concrete and tangible, a brief case study will now be presented. This case study will analyze the Canadian tar sands as the example *par excellence* of a local driver of global ecological harm. It will be demonstrated how the local phenomenon of the tar sands operation contributes (in a most extravagant and disproportionate manner) to the global problems of climate change and biodiversity loss. In this way the preceding abstract, general analysis of these two facets of the global ecological crisis will be connected to the "on-the-ground" human activities that drive these overwhelming problems. The tar sands can be seen as one of the most drastic, dramatic and catastrophically destructive examples of ecocidal human behavior, and therefore provides a valuable window into the nuts-and-bolts of anthropocentric devastation of the biosphere, recognizing that similar dynamics are at play in other egregious examples of ecocide such as nuclear power stations, coal-fired power plants and mountain-top removal coal mining.

The *tar sands* (interchangeably called the *oil sands)* are a colossal Canadian energy project that is geographically situated in northern Alberta (Smandych and Kueneman 2010, 87). The purpose of the tar sands is to produce consumable oil from naturally occurring tar-bearing sand. According to Smandych and Kueneman (2010) "the current

major tar sands operations are located in three primary districts-the Peace, Athabasca, and Cold Lake districts-surrounding the booming hub city of Fort McMurray" (Smandych and Kueneman 2010, 87). The major players in the tar sands are large national and multi-national corporations such as Syncrude and Suncor, Shell Oil, ExxonMobil, Husky Energy and Petro-Canada (Smandych and Kueneman 2010, 87). A very important role is also played by state actors at the provincial and federal level, who have often facilitated the growth of the oil sands through financial subsidies and the creation of a favorable regulatory climate. Other primary stakeholders include indigenous and First Nations communities, ecosystems and non-human species, tar sands workers and employees and environmental organizations and protest groups.

There are two major methods of extracting oil-bearing bitumen from the tar sands- strip-mining and the *in situ* method. The strip-mining method involves the creation of "large open pits accompanied by tailings ponds and a processing plant that occupy areas of up to 40,000 hectares" (Sherrington 2005, 73). The *in situ* method "uses pressurized steam, created with large quantities of water heated by natural gas, to soften tar so it can be pumped to the surface (Smandych and Kueneman 2010, 93). These *in-situ* projects "consist of well pads, roads and pipelines and cover areas of 1,000–20,000 hectares" (Sherrington 2005, 73). It is estimated that approximately 175 billion barrels of useable oil can be extracted from the tar sands using these methods, and future advances in technology may have the potential to increase this number exponentially (Smandych and Kueneman 2010, 93).

According to the Government of Alberta the oil sands are "the second largest source of oil in the world after Saudi Arabia" and the current rate of production is in excess of 1.31 million barrels per day (Alberta Energy: Oil Sands). In 2008, combined public and private sector investment in the oil sands was evaluated at 19.2 billion dollars, and this number is steadily rising (Alberta Energy: Facts and Statistics). This enormous production operation is a central part of the provincial and the national economy, and more than 145 000 people are directly employed in the mining, oil and gas extraction sector, which accounted for 28% of Alberta's GDP in 2008 (Alberta Energy: Facts and Statistics).

Ecological Impact

Unfortunately, the economic growth which is generated by development of the tar sands comes at a horrific ecological cost. According to Smandych and Kueneman (2010, 103-104) the oil sands inflict environmental harm in three major ways. First, the oil sands operation produces an enormous quantity of planet-warming greenhouse gases which contribute to climate-change related disasters and air pollution. Secondly, the extraction operation decimates the local boreal forests, destroying animal habitat and exacerbating the climate problem by obliterating an important natural carbon sink. Third, the oil sands consume a gigantic volume of water, leading to rapid depletion of groundwater reservoirs, and simultaneously contaminate aquifers, rivers and streams with toxic effluent and pollution.

These three forms of ecological harm directly result in numerous negative consequences for local human and non-human species. For example, the toxic open-air tailings ponds which are a byproduct of strip-mine extraction have resulted in a large number of bird deaths, as migratory waterfowl land in the ponds and become contaminated with lethal chemicals (Smandych and Kueneman 2010, 103-104). Both aquatic and terrestrial animals are also affected. Local fish have been found covered in mutations and tumor-like growths as a result of carcinogenic pollutants in the waterways, while moose and other forest mammals have been found contaminated with arsenic. As the forest is fractured and clear-cut, countless animals are displaced from their habitats with disastrous consequences for biodiversity (Smandych and Kueneman 2010, 103-104). Human health has also been compromised, and communities downstream from the operation have developed high rates of illnesses such as lupus, leukemia, lymphoma and autoimmune diseases, and these illnesses have "been directly linked to water contamination from the tar sands" (Smandych and Kueneman 2010, 103-104).

Furthermore, the oil sands contribute disproportionately to the climate change crisis for the simple reason that "each barrel of bitumen produces three times as much greenhouse gas as a barrel of conventional oil" (Nikiforuk 2010, 3). As a consequence, the tar-sands are single-handedly responsible for rendering Canada incapable of meeting even a single one of its climate-change related emissions reduction targets (Nikiforuk 2010, 3).

According to Nikiforuk (2010, 106) the effects of climate change around the tar-sands are already being felt. He argues that "climate change has already raised temperatures in the

region by three to five degrees Fahrenheit, and will soon turn up the thermostat another three to five degrees more" (Nikiforuk 2010, 106). The ecological consequences of this "remarkable warming" will be severe, taking the form of reduced rainfall and accelerated evaporation, and "higher temperatures will concentrate fish-killing salts and naphthenic acids in remaining water bodies" (Nikiforuk 2010, 3).

This dramatic transformation also has severe consequences for indigenous species. Animals are displaced, their nesting and hunting grounds are destroyed, and their habitat is fragmented, disrupting migration routes. This fragmentation is particularly disastrous for some species such as the pine marten, which "does not cross cleared areas that are more than 50 meters wide between forest patches" (Nikiforuk 2010, 3). Another species which suffers disproportionately is the woodland caribou, whose ability to evade wolves is compromised by the destruction of intact forest strands.

Equally troubling is the effect of the oil sands on Alberta's peatlands and fens. These environments provide an "irreplaceable…habitat for species with high habitat specificity", and the disappearance of these peatland fens is a major contributor to tar sands related biodiversity loss. Particularly disturbing is the fact that these "peatlands are vegetation communities established on organic soils over several thousand years" and therefore are essentially impossible to reclaim or recreate once destroyed (Nikiforuk 2010, 3).

There can be no reasonable doubt that radical transformation of vast stretches of pristine

forest and peatland into open-air strip mines and toxic tailing ponds will have a direct and severe negative impact on the robustness and health of local biodiversity. Birds who land in the ponds become contaminated and die, and animals who drink from them become polluted with dangerous toxins. Toxins also leach out of the soft clay of the ponds and contaminate surrounding soil. This contamination is likely to kill many microbial life-forms and insects, and others which are not killed will be eaten by birds and small mammals. In this way the toxins they contain will enter the wider food chain, and will eventually accumulate in the bodies of the human beings who rely on local fish and game for their food.

Summary

It is now evident that the Alberta tar sands project has contributed in major and multiple ways to both forms of global environmental harm. These harms have caused immense suffering to human and non-human species, destroyed irreplaceable ecosystems and habitats, and undermined the security and health of local communities. These problems are both local (contamination of local food and water sources) and global (the tar sands contribute to global warming at a planetary level). Therefore, there is a strong case to be made that the Alberta tar sands project be viewed as case of outright ecocide on a massive scale and can serve us as archetypical example of the tangible and specific human activities that contribute to the global environmental crisis.

Chapter 3: Theoretical Perspectives

This research will situate its analysis within the field of environmental sociology. Environmental sociology arose from the recognition that environmental issues cannot be understood in isolation from social factors, nor can society be analyzed as though it were divorced from, or unaffected by, the natural world of ecology. The result was the birth of a "new sociology... one that recognized the role of physical-biological factors in shaping social structures and behaviors, that was aware of the impacts of social organization and social change on the natural environment" (Buttel 1987, 466).

According to Michael Bell the role of environmental sociology is to "study the sometimes cooperative and sometimes deeply conflicting interrelations between people, the atmosphere, land, water, plants and animals" (Humphrey et al. 2002, 6). The analytical project of environmental sociology seeks to examine the relationship between cultural values and attitudes and humans behavior as it impacts upon the natural environment, while at the same time examining "the material or biophysical consequences of that behavior" (Buttel 1987, 7).

Environmental sociology begins with the recognition that human society is completely embedded within the broader structures of ecology upon which it depends. Therefore, "environmental sociologists are interested in specifying the ways that society connects with the material or biophysical environment, the cultural values and beliefs that prompt people to use the environment in particular ways, and the eventual implications of these

interrelationships" (Buttel 1987, 6). For example, social structures, ideologies, and socio-political movements such as neo-liberal capitalism or nationalistic militarism may prompt people to use the environment in unsustainable and exploitive ways, with the eventual implication of long term environmental degradation.

Environmental sociology examines questions at the nexus of society and ecology. Such questions include "who are environmentalists"? "What is the connection between environmental attitudes and behavior?" and "what are the characteristics of environmental conflicts?" (Canan 1996, 32) All of these issues are crucial to our ability to comprehend the global environmental crisis.

The modern ecological crisis is the greatest threat that has ever confronted humanity in its relatively short time on Earth. The social sciences can and must contribute to the task of analyzing the nature and origins of this problem and generating meaningful, practical insights to inform policy directions, strategic plans and effective action. Environmental sociology is an attempt to rise to this challenge, seeking "nothing less than the reorientation of sociology toward a more holistic perspective that conceptualizes social processes within the context of the biosphere" while also recognizing that social processes are the primary drivers of ecological collapse (Canan 1996, 32).

The practice of environmental sociology emphasizes "examining the connections among society, environment, and technology" in order to shed light on pressing ecological issues (Canan 1996, 32). In essence, it attempts "to challenge traditional social theory, nudging

it toward a theoretical posture that explains the systemic relationship between natural ecosystems and political economies in their dynamic variety and co-contingency, a relationship that has physical *and* social dimensions" (Canan 1996, 35). Human societies are dependent upon, structured by, connected with and embedded in the planetary ecosphere. At the same time, the socially organized activities of human beings transform ecosystems and sometimes create cascading systemic breaches and overloads that result in catastrophic environmental harms. Situated at the nexus of society and ecology, environmental sociology is ideally positioned to tackle the challenging project of analyzing the global eco-crisis and identifying the most promising strategies for its successful resolution.

This thesis leans towards a realist understanding of nature. Those who take a realist view of nature are “highly critical of the extreme relativist position” which they argue is an inherently conservative position, because “if all truth claims have validity, then there is no basis for endorsing some over others, and thus no basis for becoming proactive” (Dunlap 2002, 22). Realists point out the essential fallacy of a constructivist account of nature by pointing out that “we can neither gain biological sustenance from, nor be physically injured by, disembodied social constructions” (Redclift and Woodgate 1998, 8). Therefore, although we need to accept the fallibility and constructed nature of our models of reality, we must nevertheless account for the material conditions of our ecological existence when analyzing human effects on the biophysical environment.

Within environmental sociology the realist position criticizes the constructivist paradigm

and argues that "the environment is not merely represented through social construction, in language or symbolically. It is also the creation of human activity, human behavior affects the *environment*, leading us to consider *not only the claims that are made against nature, but also the material transformation of nature*" (Redclift and Woodgate 1998, 6). This research unapologetically adopts a realist orientation in the analysis of the global ecological crisis, attempting to ascertain what environmental sociology can tell us about actually occurring ecological harms and practical and pragmatic solutions to these problems. Throughout the discussion that follows in this thesis, questions such as how people construct their understandings of nature will be of secondary importance to a consideration of the tangible drivers of ecological harm and the strategic responses that can reverse this harm.

Within the field of environmental sociology, three major theoretical perspectives can be identified- ecological modernization theory, ecological Marxism and deep ecology. In the following chapters, all three of these theories will be applied systematically in an attempt to answer the central questions- what are the causes of and solutions to the global ecological crisis? In the process, the relative strengths and weaknesses of each theory will be assessed, in order to determine what each perspective can contribute and where each falls short.

Ecological Modernization Theory

Ecological modernization theory (EMT) argues that market forces (such as competition and supply and demand) can and will motivate improvements in industrial processes that

will result in better ecological outcomes such as reduced waste, increased efficiency and decreasing resource inputs (Buttel 2000, 59). Continuing development and adoption of innovative new science and technology is seen as offering solutions to most environmental problems. Therefore, the program of ecological modernization is to transform rather than dismantle the global industrial infrastructure and to move to an era of hyper-industrialization wherein improved techno-managerial expertise is applied to the challenges of "strategic environmental management, industrial ecology and eco-restructuring" (Buttel 2000, 59). Ultimately, EMT is closely "associated with market-based approaches (which) contend that solutions lie with the market" and "that continued industrial development offers the best solution for environmental sustainability" (Brownlee and Kueneman 2012, 60).

Ecological modernization is therefore at odds with many other environmental discourses which see technological development as highly problematic and argue that any adequate response to ecological harm will require an end to capitalism and the industrial process as we know it (Fisher and Freudenberg 2001, 702). Critics of EMT are sometimes described as falling within the counter-productivity camp, which means that they identify industrialization and technology as the *causes* of ecological harm and do not believe that these same factors can be held up as actual or potential solutions. Proponents of EMT, on the other hand, argue that although industrial activity has often been environmentally destructive, there is no fundamental reason why this should continue to be the case. To support this claim, they point to countries such as Germany and the Netherlands which have achieved substantial ecological improvements without sacrificing industrial

productivity (Fisher and Freudenberg 2001, 705). Furthermore, proponents of this perspective argue that there need be no fundamental contradiction between ecological modernization and economic growth and employment, because "there could be plenty of employment in environmentally desirable... construction projects" (Heesterman and Heesterman 2013, 4).

Many apparent examples of ecological modernization in progress have been identified by EMT researchers. For example, Scheinberg (2003) has studied the modern institution of recycling as a clear example of ecological modernization in the area of waste processing and disposal. The process of recycling is a dramatic improvement over pre-recycling processes as well as early experiments in recycling which have since been improved upon. The benefits of this process have been savings of energy and savings of materials as well as reducing reliance on virgin resources and an associated increase in cleaner production technologies (Scheinberg 2003, 70). Sonnenfeld (2000, 235) has also observed ecological modernization taking place, this time in the context of "South-East Asian pulp and paper industries". He notes that by adopting technological improvements and modeling existing environmental production practices, these industries have improved efficiency, reduced waste and progressed toward clean production (Sonnenfeld 2000, 235). EMT puts its hope in improved scientific methods and technologies coupled with economic motivators such as "tradable permit schemes" which are aimed at "meeting a politically agreed (environmental) target" and "eco-taxation, aimed at providing an incentive perhaps to exceed rather than merely achieve an (ecologically desirable) target" (Heesterman and Heesterman 2013, 161).

EMT has achieved substantial prominence within the field of environmental sociology, and Buttel describes its ascension as meteoric (Sonnenfeld 2000, 57). Mol and Spaargaren (2000, 44) point out that EMT has implications for many aspects of environmental sociology, particularly the realist-constructionist debate as well as debates on radical versus reformist environmental reforms and social inequalities regarding environmental problems. The ecological modernization model of society predicts and prescribes the transformation of society through science, industrialization and technology in a gradual process of reform, innovation, improved efficiency and dematerialization. The prerogatives of EMT "cover a wide range of initiatives, from the greening of individual products to the greening of entire production processes" (Brownlee and Kueneman 2012, 61). The end result of these processes, according to ecological modernization theory, will be the resolution of the global ecological crisis as a new, green industrial revolution puts an end to the pollution and waste that has damaged our ecosphere.

Ecological Marxism

Ecological Marxism seeks to apply, adapt and extend the voluminous theoretical insights of Marx to the analysis of the contemporary ecological crisis. This perspective "uses the insights of Marx and Marxism to show how the roots of environmental crises lie in capital's rapacious expansion and its commodification of nature" (Brownlee and Kueneman 2012, 61). As O'Connor (1998, 2) points out, "Marx *did* have a vision of

society in which humankind ceases to be alienated from nature, one in which the appropriation of nature is not based on the logic of capitalist accumulation but rather on direct individual and social need, on the one hand, and what we would today call ecologically rational production, on the other". Marx also "provided a powerful analysis of the main ecological crisis of his day—the problem of soil fertility within capitalist agriculture—as well as commenting on the other major ecological crises of his time (the loss of forests, the pollution of the cities, and the Malthusian specter of overpopulation)" (Bellamy-Foster 1999, 373). Marx's vision of society and his environmental theory therefore provides a solid foundation for a penetrating critical analysis of modern environmental problems, which has been built upon by succeeding generations of theorists who draw on and find inspiration in his ideas and ideals. The most basic and fundamental insight of ecological Marxism is "the premise that capitalism is responsible for much of the ecological damage to the planet" and that any viable solution to the ecological crisis must recognize the fundamentally anti-ecological nature of capitalism and the need for a profound transformation of this political and economic system (Brownlee and Kueneman 2012, 59).

Marx bestowed a theoretical legacy which views "human history and natural history as dialectically interconnected" and which understands "the anti-ecological nature of capitalism and the need for a theory that articulates the contradictory relationship between exchange value and use value" (O'Connor 1998, 4). On the basis of these insights modern theorists have found in Marx "a latent ecological socialist vision" which has guided and inspired subsequent developments within the field (O'Connor 1998, 4).

This vision focuses on “challenging the global system of capital accumulation (and) articulating a viable strategy for social change” (Brownlee and Kueneman 2012, 60).

The primary insight guiding ecological Marxism is that the major cause of the global ecological crisis is the fundamental contradiction between natural environmental cycles and the cycles of production and accumulation that characterize the capitalist economic system. Fundamentally, ecological Marxists are concerned with “asserting that the requirements of capital accumulation and economic growth are in direct opposition to ecological sustainability” (Brownlee and Kueneman 2012, 61). The problem is that "capitalism is a self-expanding system of economic growth. Its aim is limitless growth, or money in search of more of itself. Profit is the means of expansion, and also the goal of expansion" (O'Connor 1998, 10). Capitalism recognizes no limitations on the logic of accumulation, which is elevated to a supreme and hegemonic prerogative. And yet the natural system in which the capitalist order is embedded operates on radically different and incompatible principles, because "nature is not self-expanding, forests reach climax stages; fresh water is limited by geography and climate; fossil fuels and minerals are physically fixed. (Nature's)... rhythms and cycles are governed by a different logic than the rhythms and cycles of capital” and the source of ecological problems are therefore to be found in the contradiction between these two dialectically interconnected systems (O'Connor 1998, 10). Unlike ecological modernization theorists, ecological Marxists “see the promises of ‘market-driven technological silver bullets’ as illusory at best” and insist that a more fundamental and profound transformation of society is essential if the worst

outcomes of the global ecological crisis are to be averted (Brownlee and Kueneman 2012, 61).

Important in this respect are Marx's writings on the topic of soil ecology and soil depletion and his concept of "metabolic rift". According to Clausen and Clark (2005), a metabolic rift is "a rupture in the metabolic processes of a system" (427). Metabolic processes have to do with the cycling of nutrients and energy within an organic system, and ruptures within these processes result in interruptions or distortions of such cycles. Marx observed that traditional modes of agriculture returned part of the produce of the land to the soil in order to preserve long term fertility. This system ensured the continuity of the metabolism of the soil system and preserved the integrity of the agricultural ecology. Industrial practices and capitalism changed farming practices dramatically, by emphasizing the extraction of commodity crops from the rural farms for sale in urban markets. This process systematized the extraction of nutrients and energy from the soil, which, rather than being returned to the earth, was instead transformed into urban waste in the form of sewage and refuse (Foster 1999, 77). As a result, "the basic processes of natural reproduction were undermined" resulting in "a squandering of the vitality of the soil" (Foster 1999, 77).

Marx's analysis of soil depletion is the prototypical example of metabolic rift and its relation to capitalism. From an ecological Marxist point of view, the capitalist struggle to extract profit through exploitation of natural systems almost invariably results in "an irreparable rift in the interdependent process of...a metabolism prescribed by the natural

laws of life itself" (Foster 1999, 77). Because the profit motive does not take the needs of ecosystems into account, it invariably disrupts and destabilizes those systems and in the process undermines its own viability. In the quest to wrench profit from the soil, the soil is destroyed and obtaining future profit from it becomes impossible. This exemplifies "the ways that capital limits itself by impairing its own social and environmental conditions", a process which O'Connor (1998, 159) refers to as the second contradiction of capitalism. Although ecological modernizationists are likely to point out that some of the imperatives of profit making, such as cost minimization, may lead to reduced use of inputs and thus reduced ecological harm, ecological Marxists are more likely to see profit making as environmentally destructive.

Capitalism attempts to adjust itself and adapt to the changing conditions imposed by its tendency to destroy its own material base, yet because it ignores the underlying cause of these problems it only ends up exacerbating them. For example, aquaculture "not only fails to mend the metabolic rifts that it produced, it also increases the existing rifts and creates new ecological disruptions" (O'Connor 1998, 436). In this regard, ecological Marxism is in direct conflict with the premises of ecological modernization theory. Whereas ecological modernization believes that reflexive improvements and advancements in technology and methods of production can solve environmental problems, eco-Marxists point out that "these kinds of supertech solutions" actually tend to "deepen, not resolve, ecological problems" (O'Connor 1988, 171).

In addition to identifying the causes of environmental harm in metabolic rift and the

contradictions of capitalism, ecological Marxism also makes recommendations for the future of environmental activism, resistance and restoration. Strategically, eco-Marxism has high hopes for the potential of a political alliance between ecological social movements and those focusing on labour rights, social justice and economic equality, an alliance which is referred to as "red-green politics" (Dickens 2002, 67). This fusion of red and green social movements would "constitute an alliance against capitalism and against capitalism's degradation of the environment" (Dickens 2002, 53). The ultimate hope is that this red green alliance would gain momentum and eventually manifest as "a rebellion of nature, that is, powerful social groups demanding an end to ecological exploitation" (Dickens 2002, 171). It is this rebellion of (and for) nature that holds the best hope for reversing the global ecological catastrophe inflicted by capitalist exploitation of the earth.

Ecological Marxism takes issue with ecological modernization theory, which it sees as serving to legitimate the capitalist system by providing Band-Aid solutions in place of revolutionary change. This perspective “demonstrates the inherent limitations of technological and individualist solutions to the crisis, advocating instead for a fundamental reorganization of production and a major global social transformation” (Brownlee and Kueneman 2012, 61). Although ecological Marxists would be eager to enlist deep ecologists as allies in their red-green revolution, they may also find deep ecology's ecocentric values and spiritual flavor incompatible with their historical materialist project.

Deep Ecology

Albert Einstein “told us that we cannot solve a problem with the same kind of thinking that produced it” (Sachs 2008, 14). This means that if we are to confront the unprecedented challenges of the global environmental crisis, we will need a radically new kind of thinking capable of carrying us through a complete transformation of our individual lifestyles and our global society. Old ways of thinking have led us to the very precipice of global catastrophe, and new ways of understanding ourselves and our relationship to the world are urgently needed. This leads us to deep ecology, which describes "the deeper, more spiritual approach to nature" (Devall and Sessions 1985, 454).

Historically, a major flaw in human thinking has been its pervasive *anthropocentrism*. Anthropocentric paradigms “contain a view of human society as the center of the natural world, with humans controlling and using the environment without regard to the natural resource-based limits to social growth” (Humphrey et al. 2002, 25). These paradigms are what environmental sociologist Dunlap (2002) calls “the Human Exemptionalism Paradigm” or HEP. This paradigm has been dominant throughout recent human history, but is based on fundamentally flawed premises.

Essentially the human exemptionalism paradigm holds that humans are a distinct and special form of life that is entirely separate from, and exalted over, all other species of animals and plants. Furthermore, this viewpoint believes that social and cultural factors (such as the economy or religion) are the only major determinants of human actions and

conditions, while the biophysical environment is essentially irrelevant. Finally, the HEP clings to the idea that cultural, social and especially technological progress can and will solve all present and future environmental and social problems (Dunlap 2002, 25-26).

Closely related to the human exemptionalism paradigm is what deep ecologists Catton and Dunlap call the Dominant Western Worldview or DWW (Dunlap 2002, 43). The DWW is based around three core ideas. First, that "humans are fundamentally different from all other creatures on earth, over which they have dominion" (Dunlap 2002, 43). Second, that "the world is vast and provides unlimited opportunities for humans" and finally that "the history of humanity is one of progress; for every problem there is a solution, and thus progress need never cease" (Dunlap 2002, 43). Together, the HEP and DWW have led humanity blindly down the road to ecological suicide.

The problem is that the HEP and the DWW are "both obsolete and in contradiction with the realities of resource scarcity and natural environmental limits to social and economic expansion" (Dunlap 2002, 26). According to deep ecologists, the human exemptionalism paradigm is deeply flawed. For one thing, there is no single feature that definitively sets human beings apart from other species of life. Animals such as dolphins display language and communication abilities, and some chimpanzees and orangutans have been trained to speak fluently in sign language. Animals such as whales have been proven to display the qualities of culture, and have been observed to pass down ancestral songs from generation to generation, and to share songs from one pod of whales to another.

Animals, like humans, have been demonstrated to possess emotions such as grief, fear, playfulness and affection, and some (such as otters) even cry tears when bereaved. Elephants and some primates are able to paint and create art, and tool use is evidenced by crows and octopi, while ants and bees display complex social organization, military strategy, herding, domestication behaviors and agriculture. The mounds of termite colonies display phenomenally sophisticated engineering and the equivalent of advanced urban planning. Therefore, despite our unusual ingenuity and adaptability, deep ecologists claim that we humans are not nearly as unique as we think, and our tendency to treat animals as objects and commodities (rather than as thinking, feeling entities in their own right) is both ethically and scientifically unsound.

The idea that humans exist apart from and unaffected by ecological processes is likewise viewed to be a mere fantasy, as evidenced by events such as hurricane Katrina and the recent Fukushima earthquake and tsunami in Japan, not to mention the worldwide phenomenon of global warming. Furthermore, the faith in technological fixes to repair environmental harm is seen to be becoming more and more untenable, as evidenced by the bungled and impotent responses to recent catastrophes such as the British Petroleum oil spill in the Gulf of Mexico and the nuclear meltdowns after the tsunami in Fukushima.

For these and other reasons, Catton and Dunlap advance an alternative paradigm that they call the New Ecological Paradigm or NEP. The NEP is based on four key ideas. First is the recognition that "humans…are but one among many species that are interdependently involved in the global ecosystem" (Dunlap 2002, 25). Second, human affairs are

entangled in the intricate feedbacks of the web of nature, and therefore human actions very often have unintended consequences. Third, humans are completely "dependent upon a finite biophysical environment that imposes potent physical and biological restraints on human affairs" (Dunlap 2002, 26). Finally, and very importantly, "however much the inventiveness of humans… may seem for a while to transcend carrying-capacity, ecological laws cannot be repealed" (Dunlap 2002, 43). These four core concepts serve as an essential corrective to the flawed thinking that has led us so far down the path to environmental collapse.

The New Ecological Paradigm provides an excellent first step in the project of devising a new moral, ethical, theoretical and philosophical basis for a human civilization that is capable of responding to the challenges of global ecocide. Although the NEP forms the heart of deep ecology, these ideas are taken even further in the fullness of its expression. Deep ecology was developed by the Norwegian philosopher Arne Naess (1986, 2008), and was further developed by environmental sociologist Bill Devall (2001, 2006), and the tenets of deep ecology should be kept in mind when analyzing and acting on environmental issues.

Deep ecology is "a normative, eco-philosophical movement that is inspired by our experience as humans in nature and in part by ecological knowledge" (Dunlap 2002, 44). Arne Naess (1986) argued that there is an urgent "need to change the cultural concept of the self from an anthropocentric self-conception to a bio-centric self-conception" (Dunlap 2002, 44). This means that human beings need to see themselves in relation not only to

their fellow humans but also to non-human species and ecosystems such as forests and mountains, which are conceived of as "entities" with whom we have a morally significant relationship (Dunlap 2002, 44).

Deep ecologists "recognize the fundamental value of biodiversity, not because biodiverse environments offer scientists the opportunity to develop pharmaceutical products, but because the plants, animals and other forms of life…have intrinsic value" (Dunlap 2002, 45). This idea of intrinsic value is directly opposed to market based concepts of monetary value as determined by supply and demand. Devall says that animals and "non-human life have value in themselves", value that we have no right to destroy (Dunlap 2002, 44).

The basic principles of deep ecology are as follows. First, "the wellbeing and flourishing of non-human life on earth have value in themselves independent of the usefulness of the non-human world for human purposes" (Naess 1986, 405). Second, "richness and diversity of life forms are also values in themselves" (Naess 1986, 405). Third, "humans have no right to reduce this richness and diversity except to satisfy vital needs". Finally "present human interference with the non-human world is excessive and worsening" and the restoration of environmental harmony requires "a substantially smaller human population" and the reform of policies which "affect basic economic, technological and ideological structures" and move those structures in the direction of ecological preservation and restoration (Naess 1986, 405).

Deep ecology and the NEP combine to provide a new ecological philosophy based on

respect for the interconnectedness of all life, commitment to the preservation and restoration of wildlife and ecosystems, and a spiritual, aesthetic and moral appreciation of the beauty and wonder of Earth's natural biodiversity. Most importantly, deep ecology is a call to action, and "several of the newer environmental organizations in the United States such as the Sea Shepherd Conservation Society… and Earth First! Politically act upon the principles of deep ecology" (Naess 1986, 45).

Deep ecology seeks to systematize a new way of being which radically transforms the ways in which humans understand the natural world, non-human life forms and the relationship between human society and ecosystems. Deep ecology aims to replace the "deep cultural pathology" which has led us to the present state of profound global environmental harm with a new ethical, aesthetic, emotional and moral valuation of non-human nature (Berry 1996, 9).

The literature of deep ecology draws attention to the severity and urgency of the global environmental crisis and its component ecological harms, often asserting that the very survival of humanity is in peril. For example, Berry (1996) observes that as a result of human activities "the Earth's ecosystems" are being "shattered in an irreversible manner" to the extent that "the viability of the human species is now in question" (11). Beyond just the threat to the human race, deep ecologists such as McLaughlin (1993, 87) argue that the anthropogenic "disruptions of ecological processes...threaten all forms of life on this planet". Therefore, deep ecology begins with an apocalyptic reading of modernity in which the blame for the end of civilization and the wholesale destruction of life on Earth

falls squarely on humanity and its ecocidal practices.

Deep ecology reasons that the violence which humankind has inflicted upon the Earth arises in large measure out of the anthropocentric paradigm which has dominated civilization, particularly since the industrial revolution. Because humans have believed themselves to be separate and distinct from nature as well as fundamentally superior to all other forms of life, an instrumentalist view of non-human life has taken root which treats all living things merely as resources for extraction and consumption by human beings. Therefore, deep ecologists argue that if it is such ecologically ignorant and morally perverse understandings of the environment that have brought us to this dire state of ecosystem degradation, there is an urgent need for a new worldview and a new paradigm which fundamentally re-imagines the relationship of humankind to the broader "life community" and "the community of all living species" (McLaughlin 1993, 10).

The new paradigm offered by deep ecology is described by McLaughlin (1993) as having at its heart a belief that non-human life has inherent or intrinsic value which does not depend on economic or instrumental value to humankind but in fact transcends all such considerations. This can be understood in terms of the *sacredness* of life, or it may be grounded in love, caring and compassion and the "felt sense of relatedness to the rest of nature" (McLaughlin 1993, 87).

In addition to the intrinsic value of individual life forms, deep ecology also recognizes profound inherent value in biodiversity and ecological richness itself. Therefore, not only

specific plants and animals but also species and ecosystems have a right to exist and sacred worth that is not reducible to or dependent upon human valuations. Deep ecology takes a radical stance by arguing that humans have *no right* to destroy life or biodiversity except to satisfy essential needs, a stance which is fundamentally at odds with the dominant consumer-driven exploitation of any and all desirable "natural resources". Not only does deep ecology forbid and condemn the vast majority of our consumption (as only a small portion of it fulfills truly vital needs) it also demands a rapid and dramatic reduction in the human population, recognizing that the richness and variety of life cannot survive unless human numbers are reduced to a fraction of their current levels.

These prescriptions arise from the awareness that human devastation of the natural world has been excessive, and therefore radical and transformative reforms are urgently needed at every level and in every facet of society. Because of its emphasis on respecting the intrinsic value of life and preserving ecosystems for their own sake, deep ecology is uneasy with the development and industrialization focus of ecological modernization, which promises to extend human transformations of ecology and puts its faith in science and technology rather than a spiritual reverence for pristine nature. Although deep ecology may find more common ground with ecological Marxism, it is likely that the Marxist emphasis on social justice, equality and human emancipation would mandate slightly different priorities than the ecocentric prerogatives of deep ecology.

Chapter 4: Methodology

This research is based on the careful assessment, critique and synthesis of materials such as academic research papers, scientific data, news reports and industry and government publications. These materials are thoroughly and systematically analyzed by applying the theoretical perspectives of ecological modernization theory, ecological Marxism and deep ecology. The relevance and salience of the theories to the interpretation of research data are assessed, and congruencies and discrepancies have been identified. At the same time, I identify where the three theories agree with one another and where they are at variance. Thus, my data analysis is reciprocal in that the data are interpreted in the light of the theories, and the theories are assessed on the basis of the data. Finally, the most useful insights of all three have been synthesized in order to present an answer to the key research questions. Through interpreting the data through the lens of the theoretical frameworks, it is possible to articulate what the major causes of the ecological crisis are, and what potential solutions to this crisis hold the most promise for ensuring human survival and environmental restoration.

Key research materials include the publications of the Intergovernmental Panel on Climate Change (IPCC), the United Nations Environment Programme (UNEP), Greenpeace, the World Wildlife Fund (WWF), the David Suzuki Foundation, and other media, government, industry and non-governmental organization (NGO) sources. A key source of data on biodiversity loss is the WWF's Living Planet Index and the publications

of the Convention on Biological Diversity. A key source of data on climate change is the assessment reports of the IPCC and the publications of the United Nations Framework Convention on Climate Change. Other key sources include the publications of the Global Oil and Gas Industry Association for Environmental and Social Issues, the Earth System Governance Project and the Global Environment Facility.

Chapter 5: Finding the Causes

What are the Major Causes of the Global Ecological Crisis?

We begin our analysis by tackling the first key research question: What are the primary driving causes of the global ecological crisis? Our review of the three theoretical perspectives has demonstrated that each paradigm within environmental sociology offers a different analysis of what is causing the global ecological crisis. For ecological modernizationists, the root cause is outdated, inefficient and polluting technology and infrastructure combined with sub-optimal systems for rationally managing production processes (Brownlee and Kueneman 2012; Scheinberg 2003). For ecological Marxists, the core problem is capitalism and the irreconcilable contradictions between capitalism's focus on growth and accumulation and the needs of a finite ecosphere that cannot sustain infinite growth. They see the alienation of nature as part of the alienation of the human being under the capitalist regime, and argue that without dismantling the capitalist hegemony, the ecological crisis will continue to worsen year after year. Finally, deep ecologists argue that the root cause of the ecological crisis is anthropocentrism and the dominant western worldview which promotes an instrumentalization of nature and the unrestrained exploitation of a biosphere reductionistically portrayed as nothing more than a resource repository. All three of these assessments of the causes of the global ecological crisis are valid and each tells part of the story.

However, for the purposes of this research, we must also explicitly consider two major trends or dynamics that I believe to be fundamental to the question of what is really

causing the ecological crisis. The first of these is human population growth, and the second is the hyper-consumption of the affluent.

As the following sections will demonstrate clearly, "an economic system based on limitless consumption in combination with an ever increasing world population spells disaster for the integrity of the natural world" and there is therefore an "urgent need to rectify the damage that is still being inflicted on the ecosystem, to find a human lifestyle that does not attack its own physical and biological basis" (Heesterman and Heesterman 2013, 1). Therefore, "to avert ecological disaster… we must move beyond a system based around exponential economic (and population) growth to one that takes into account the environmental costs of production and refocuses society's energies on building more sustainable ways of living" (Brownlee and Kueneman 2012, 61). After introducing the problems of population and over-consumption in the following sections, we will see how each of the three major theoretical models engages with these issues in different ways as we consider how each of the main theories may be applied to generate solutions to the global ecological crisis.

Population Growth

The causes of the global ecological crisis are incredibly, often bewilderingly diverse. It is for precisely that reason that it is so important to identify the "crosscutting" causes of environmental harm. These crosscutting issues are so called because they play a role in causing and aggravating virtually every form of ecological problem. Water scarcity, deforestation, waste and pollution- all are aggravated exponentially when the population

of human beings increases in an excessive and uncontrolled fashion. For this reason "overpopulation is a…crosscutting issue that often overshadows discussions of more specific problems" (Stoett 2012, 14). This is because "regardless of the topic under discussion, population density will be a major factor" (Stoett 2012, 14). For example, "much of the deforestation that contributes to global warming and reduces biodiversity in places such as the Amazon Basin is related to population pressure" (Stoett 2012, 14). Despite the fact that some countries are experiencing falling birth rates, we must heed the warning that "the claim that we don't have to worry about any more population growth is entirely premature", and this is because "the population of most poor countries will continue to grow for many decades, even (if) their birthrates fall" (Stoett 2012, 62-63). In any case, whichever ecological issue we wish to grapple with, "whether we are discussing deforestation or overfishing, population pressure is a constant (and invariably negative) factor" (Stoett 2012, 62-63).

Therefore, many scholars believe that we must accept and come to terms with the fact that foremost among the root causes of the global crisis is the problem of human population growth. The exploding number of human beings is directly related to the exhaustion of natural resources such as oil and fresh water and the erosion of habitats and ecosystems. More human beings means more demand placed on limited supplies and a larger load on the Earth's basic carrying capacity. Korten (2006) argues that the rapid upsurge in human numbers has already exceeded the Earth's ability to sustain, and he points out that "somewhere around 1980, we humans crossed an evolutionary threshold: the burden we place on the life support systems of the planet passed beyond the

sustainable limit. The figures are sobering. Just since 1950, in barely more than fifty years, the global human population more than doubled from 2.6 billion persons in 1950 to 6.4 billion in 2005", with a corresponding intensification of our ecological footprint (Korten 2006, 59).

Sachs (2008) predicts that the population boom will continue, and "the global population will rise… to 9.2 billion in 2050" (22-23). As a result of this population growth, combined with the increasing material demands placed on the earth by each individual person, Sachs predicts that by 2050 humanity's overall impact on the planet Earth will be six times what it is today. This is essentially an apocalyptic scenario, because "the human impact on the environment today is already unsustainable" and therefore "a six fold impact would be a devastating… environmental catastrophe" (2008, 30).

The truth is that the world is simply not large enough to sustain present and predicted human populations. When the numbers of a species exceed the carrying capacity of their supporting ecosystem, this is called a state of *overshoot.* According to the "calculations of the Living Planet Index, we humans have been in ecological overshoot since roughly 1970", and the discrepancy between what we demand of the earth and what it can provide continues to grow (Sachs 2008, 61). As a result of rapid population growth combined with rising consumption patterns, "by 2002, humans were consuming food, materials and energy at a rate of about 1.2 Earth-equivalent planets" (Sachs 2008, 59). This already dire situation is poised to become much worse, as "the United Nations projects that the world population will continue to grow from the current 6.4 billion to 9.2 billion in 2050"

(Sachs 2008, 67).

Normally a species in overshoot is subjected to population adjustment in the form of die-offs which result from ecological feedback mechanisms. For example, if wolves become too numerous and consume too many deer, they will run out of food and many will starve, restoring the balance. However, humans have so far been able to avoid a massive die-back to sustainable numbers, largely because of technological innovations such as advances in agriculture and medicine. Nevertheless, the consequences of population overshoot are inescapable, and "the difference between human consumption and the regenerative capacity of Earth is made up by depleting the natural capital of the planet-both non-renewable capital, like minerals and fossil fuels, and renewable capital like forests, fisheries, soil, water and climatic systems. The consequence is to extract a temporary and unsustainable subsidy from Earth to support current consumption at the expense of our children and their children for generations to come" (Sachs 2008, 67).

The dangers inherent in unrestrained population growth have been known since 1798 when the "economist and demographer Thomas Malthus argued that human population growth would tend to outrun the growth of food production…because population growth proceeds exponentially while food production increases only arithmetically" (Sachs 2008, 312). As a result "a population will tend to consume all available food and never leave a surplus unless population growth itself is halted" (Sachs 2008, 312). Such a halting can be voluntary and intentional, as in the case of widespread birth control use and child limitation policies, but more often it is in the form of an uncontrolled ecological feedback

resulting in mass deaths from poverty and hunger as geometric population growth outstrips the arithmetical (and limited) growth of food supplies.

Malthusian logic suggests that the unrestrained explosion of human populations within the confines of a finite and already overtaxed world must lead to a massive population rebalancing before much longer. Even with abundant fossil fuels and the high-yield agriculture they make possible the Earth would struggle to provide for the nearly 9 billion people we expect to inhabit this planet by 2050. Yet as we have seen, those enormous hydrocarbon inputs are now jeopardized by peak oil and the decline of existing reserves and rates of supply, even as the natural abundance of forests and oceans is depleted by biodiversity loss. As such, humans are in a double bind, and the likely result is that "Earth is poised to (teach us) a traumatic lesson in the…systems principle that infinite growth cannot be sustained in a finite system and the cybernetic principle that failure to take timely action to restore system equilibrium results in overshoot and collapse" (Sachs 2008, 61). This collapse could take the form of widespread famine, a virulent pandemic or a world-war, each of which could dramatically reduce the human population. Without such a reduction in the human population, "it is the planet itself, the health of the atmosphere and the oceans, the very basics of life that are under threat" (Heesterman and Heesterman 2013, 4).

Consumption

Although there has been "an ongoing debate about whether the reproduction of people in the south or overconsumption by people in the north is the greater threat to planetary

survival…most of us have moved along and realized that these are *both* serious problems" (Stoett 2012, 14. emphasis added). Furthermore, "as the consumer base in countries such as China and India increases in size and appetite, the consumption versus overpopulation debate becomes less of a debate, and both are seen as… a threat to collective survival" (Stoett 2012, 14). Therefore, we can unequivocally conclude that human population growth is only one part of the equation. Also fundamentally important is the issue of consumption.

It is extremely important to remember that consumption and harm to the environment is far from equally distributed among the human population. This is because "not all people have the same demands, and, arguably, affluence is as big a threat to ecosystems as dense human populations" (Stoett 2012, 14). Privileged inhabitants of the developed countries consume many times more of the Earth's resources, and produce far more pollution, than do the inhabitants of developing and marginalized nations. For example "one billion people in the industrialized world consume nearly 60 percent more energy than five billion people in the developing world" and Canadians and Americans consume nine times as much energy as a person in China and thirty times more than an inhabitant of India (Homer-Dixon 2010, 89). Most dramatically, "the United States has a very large population accustomed to absurd habits of consumption" to the point that "national identity has been consciously tied to this voracious appetite, which is even viewed as a character strength" (Stoett 2012, 14). This clearly demonstrates that responsibility for environmental degradation is not evenly distributed, and rests much more heavily on shoulders of developed and industrialized nations.

It is clear that it is not only our unchecked reproduction that is unsustainable, but also the voracious consumption patterns of the privileged. After all, "it would take at least an additional three to four planets to support the excluded populations of the world at the level of consumption now prevailing in Europe" (Korten 2006, 67). This means that the average European is consuming at least three to four times as much of the Earth's resources as it can provide, at the expense of all other forms of life and future human generations. By 2050 we will require "the resources of yet another one to two planets to support everyone at the current European standard" (Korten 2006, 67). Humanity is simply taking too much from the Earth, and killing it in the process.

The key point here is that it is not simply "humanity" that is destroying our planet, but rather the majority of the blame falls on "the rich, with their exaggerated patterns of consumption and waste" (Mattei and Nader 2008, 24). This point serves to illustrate the close relationship between ecological issues and issues of social justice. After all, it is not simply an environmental problem that the rich consume and pollute so much, but also a profound issue of inequality. For both ethical and ecological reasons, it is unconscionable that "children are starving amidst scenes of catastrophic violence while thousands of miles away (the economically privileged) ride in 3-ton gas-gulping SUVs" (Mattei and Nader 2008, 11).

It is impossible to overstate the importance of over-consumption on the part of the global rich as a primary driver of global environmental harm. Mattei and Nader (2008) argue

that “on this planet, resources are scare, but, if the rich were legally forced to respect the limits of decency, there would be more than sufficient resources for all to live well” (216). For the privileged, the imperatives of the global ecological crisis demand nothing less than “a total change in our lifestyle” to bring the material demands of our culture back in to line with the finite generative capacity of the planet (Mattei and Nader 2008, 172-172).

In order to achieve such a change, it will be imperative to change the way in which the resources being consumed are valued and priced, because “if critical resources of the Finite Earth, such as the integrity of the atmosphere and the biological diversity of life, were properly represented as a financial cost, there would be incentives towards their conservation” (Heesterman and Heesterman 2013, 4). At present, “the opposite is the case” because “'efficient' production provides incentives toward the wanton over-exploitation of vital, but unpriced or inadequately costed resources”, and this urgently needs to be changed (Heesterman and Heesterman 2013, 4).

The consumption associated with “human activities exerts an unacceptable pressure on a range of natural resources, such as the integrity of the atmosphere, the oceans, underground aquifers and supply of fresh water (and) as a result entire ecosystems are under threat, including the survival of animal and plant species” (Heesterman and Heesterman 2013, 10). The resources being consumed “are precious assets vital to human well-being, yet do not command an (adequate) price and are therefore not subject to (appropriate) constraints. When important scarce natural resources are unpriced, the very

enhancement of efficiency of marketable resources may well result in a threat to many irreplaceable natural assets, which do not command a (sufficiently high) price" and are therefore subject to excessive and wasteful levels of human consumption (Heesterman and Heesterman 2013, 10).

In light of these realities, it becomes clear that both reproduction and consumption are issues charged with profound moral significance. If the human population is already in overshoot, then choosing to have children (and especially the decision to have more than two children) is arguably a selfish and immoral act that accelerates the headlong race of the species towards catastrophe. Similarly, in a world where billions of people lack adequate food and water, it is ethically unjustifiable for the privileged few to consume many times their share of the Earth's resources. As a result of these reckless and short-sighted behaviors, "the human species is quite literally consuming the future of its children, consigning billions of people to lives of desperation, and calling the survival of our species into question" (Korten 2006, 67).

Chapter 6: Applying the Theories to Generate Solutions

To this point, the basic facts about climate change and biodiversity loss have been elaborated, and in the process it has been demonstrated that we are indeed facing a global ecological crisis of potentially apocalyptic proportions. In addition to the causes identified by the three major theoretical perspectives (inefficient technology, capitalist hegemony and anthropocentrism, respectively) we have also identified two fundamental causes for the global ecological crisis - population growth and the hyper-consumption of the wealthy. The three basic theoretical perspectives of environmental sociology (ecological modernization theory, eco-Marxism and deep ecology) have also been introduced. The next phase of this project is to systematically apply each of these three theoretical paradigms to the analyses of the problems of biodiversity loss and climate change, and in the process to formulate insights into how the global ecological crisis can be stopped, how its course can be reversed and how the ecosphere can be repaired.

Ecological Modernization Strategies

In contemporary environmental discourse, ecological modernization "is often offered as the commensurate paradigm. It does not demand radical change but argues that technological changes can save us; strategies such as eco-efficiency- cleaner, more efficient, less resource-intensive technologies" (Stoett 2012, 9). The ultimate goal of this process of technological innovation and adaptation is "the organizational internalization of ecological responsibility" (Cohen 1997, 109). The appeal of ecological modernization largely rests in its promise that "economic growth can continue" so long as we "make

wiser technological choices" (Stoett 2012, 9). Because of the ideological hegemony of global capitalism and its unwavering dedication to profit and growth, the ecological modernization paradigm is understandably seen as more palatable to "the powers that be" than the more radical perspectives of ecological Marxism and deep ecology.

From an ecological modernization point of view, responding to the dire threats posed by climate change and ecological harm will require drastic and radical alterations to the scientific and industrial infrastructure of society. This approach aims to "identify ecological modernization mechanisms and dynamics that direct a still dominant market driven global capitalism into more sustainable directions" (Mol 2002, 92). Sachs (2008) argues that what is required is nothing less than "a worldwide renewable energy program" that will pave the way "toward a third industrial revolution that makes use of solar and other renewable energy sources to transform the global economy" (13). Humanity must work co-operatively towards a global scientific revolution which will re-harmonize society with the natural world by transforming the energy infrastructure on which our civilization depends to one based primarily on renewable, ecologically rational and non-polluting power sources such as solar, tidal, geo-thermal and wind.

This perspective recognizes that "for some problems there is no alternative to a known solution, (and) climate change is just such a problem. At the heart of the problem is the increasing emission of GHGs to the atmosphere as a result primarily of industrial processes" (Zia 2013, xv). Therefore, the solution *must* recognize "the need for clean sources of energy that do not enable the release of C02 into the atmosphere" (Zia 2013,

xv). Discerning what forms of energy generation most effectively meet this need is central to the project of ecological modernization, which "combines a realist attitude towards market ideologies and dynamics hegemonic in the world today with a reformist approach to the environmental redesign of contemporary societies" (Sonnenfeld 2002, 2).

Because of the high hopes that ecological modernizationists attach to science and technological innovation, they might be tempted to put forward expanded nuclear energy as a potential solution to global warming, as nuclear power is sometimes seem as less carbon intensive than conventional coal and oil energy. However, because nuclear power generation is actually highly carbon intensive (when the costs of mining, transporting and refining uranium are included in the analysis), water intensive (for gluttonous cooling systems) and productive of unmanageable toxic waste, it cannot be considered an ecologically safe alternative to fossil fuels. Furthermore, catastrophic nuclear disasters such as Chernobyl, Three-Mile Island and Fukushima starkly illustrate the enormous and largely unpredictable risks implicit in nuclear power, and have demonstrated to the world that nuclear power threatens the health of people and environments on a global scale. Therefore, “the aim of restoring (environments) and safeguarding future (generations) is (perhaps better) served by large-scale programmes of public investment in green technology such as the development of structures to produce renewable forms of energy”, not hazardous nuclear plants (Heesterman and Heesterman 2013, 1-2). A more defendable ecological modernizationist approach thus favours strong improvements in the efficiency of existing power sources and the replacement of polluting power sources with cleaner “green” energy generating technologies made possible by scientific

advances and made feasible by market-based incentives.

The most attractive and environmentally friendly form of energy is arguably solar, and it is to solar power that we could perhaps turn if we truly wish to make the transition to an ecologically sustainable society. According to (Sachs 2008) solar energy is "the largest, safest and longest-lasting energy source", and if properly utilized the sun's energy could easily provide for "ten thousand times our society's use of commercial energy" (102). The relatively high cost of generating solar power is sometimes cited as an obstacle to wide-scale adoption of solar energy. But when the enormous ecological and social costs of conventional hydrocarbons are factored in, the safety, sustainability and limitless nature of solar power make it a relative bargain. Furthermore, some of the dirtiest and most destructive energy industries, such as oil and tar sands, currently enjoy billions of dollars of 'corporate welfare' in the form of government subsidies. These subsidies should be reallocated towards research and development for more efficient solar energy production and the implementation of existing solar infrastructure. Moreover, Green investment projects would be commercially attractive if it were not for the omission of environmental degradation as a cost of production under the prevailing false price structure (Heesterman and Heesterman 2013, 2). Arguably, if it is to live up to its utopian promises, the new industrial revolution advocated by ecological modernizationists must largely be a solar-revolution that transforms industry by harnessing the infinite, safe and clean energy available from our parent star. At the same time "an accelerated green investment programme will give humanity the time to address the underlying flaws in the current exclusively market and affluence-oriented mode of economic management"

which does “not adequately include the cost of overstressing of vital capabilities of the earth” (Heesterman and Heesterman 2013, 2).

It is worth noting that although current nuclear technologies have inflicted horrific environmental damages in the past, and continue to threaten human survival with the omnipresent risk of “a disaster of unimaginable ferocity”, future scientific developments may revolutionize the technology and render it ecologically attractive (Heesterman and Heesterman 2013, 250). For example “the thorium reactor type… is supposedly much safer” (Heesterman and Heesterman 2013, 250). Although such thorium reactors are likely to be a great improvement over the disastrously perilous older models, it is ultimately the case that “fusion power is really the only safe nuclear option” (Heesterman and Heesterman 2013, 50). This “technology is safe (because) it does not produce any long-lived radioactive waste (and) a large-scale nuclear accident is not possible” (Heesterman and Heesterman 2013, 250). Therefore, fusion is an extremely attractive possibility for meeting our future energy needs. Unfortunately, fusion technology is not expected to become viable until 2050 at the earliest. Therefore, solar, wind and other renewable energies must remain our primary priority for investment in the immediate future.

The second step in solving the problem of climate change is to reduce emissions from automobiles. Among the most promising directions for the reduction of transportation related emissions is to be found in “new hybrid technology that combines the use of gasoline with battery power” (Sachs 2008, 98). This technology can deliver a “potentially

enormous increase in miles per gallon" and could, if combined with clean electricity, substantially decrease global carbon emissions. Sachs (2008, 99) predicts that "plug-in hybrids would avoid carbon dioxide at a cost below $25 per ton of avoided emissions". Widespread adoption of plug-in hybrid or fully electric vehicles (combined with green travel options such as mass transit, carpooling, cycling and walking) can play a significant role in reducing emissions and combating global warming.

The third major step is to clean up polluting industrial processes in major sectors such as refineries, cement, steel and petrochemicals (Sachs 2008, 97). The best way to reduce industrial emissions is to "put a price on carbon emissions… through a combination of emission taxes and tradable permits" (Sachs 2008, 112). These economic incentives may potentially motivate the operators of polluting factories to adopt cleaner technologies and reduce overall emissions. Industrial emissions may also be rgeduced through the integration of on-site carbon capture and sequestration technologies and on-site solar power and hydrogen fuel cells (Sachs 2008, 100).

Following the logic of ecological modernizationists, a fourth step would be to economize on the use of electricity by adopting more efficient and environmentally sound technologies in homes and businesses through increasing efficiency. The "purpose of increasing efficiency is to achieve a relative, and perhaps even an absolute minimization of resource consumption and burden on the sinks (the environmental media air, water and soil" (Huber 2000, 270). Energy efficient motors, lighting, appliances and insulation are examples of green consumer technology. Particularly important in this regard is the

emerging practice of green building, which entails "designing homes and commercial buildings…to tap into solar radiation (both direct sunlight and solar panels), recycle waste and water, use better insulating materials and harvest rainwater" (Sachs 2008, 100). Widespread adoption of such technologies and practices, encouraged by economic incentives such as tax credits, could substantially improve the environmental sustainability of our society and reduce per-family rates of carbon emissions.

Ecological modernization can also inform our strategic responses to climate change and biodiversity loss, both of which must emphasize the protection of forests, which function as carbon sinks as well as indispensable habitats. Much deforestation is driven by the efforts of human beings to clear forest land in order to establish agricultural practices such as cattle ranching or soy bean plantations. Sachs (2008, 97) argues that in order to reverse this trend, governments need to provide "modest economic incentives, such as a payment to the local community to preserve the forest rather than turn it into pastures". By providing such incentives governments can reward forest conservation and make it profitable for local people to protect forests rather than destroy them. An example of successful forest conservation efforts can be found in Costa Rica, which has chosen to protect its national forests and earn income from them in the form of ecotourism rather than clearing the forests to support logging and ranching interests (Pagiola 2008). This reliance on market-based incentives to solve ecological problems is typical of the ecological modernization philosophy, which sees managerial techniques and economic pressures as the primary solutions to environmental problems.

There is a fifth strategy that is most closely associated with ecological modernization, a strategy that takes the ecological modernizationist faith in science and technology to a radical extreme- a strategy known as geoengineering. Scientific and "technological solutions in the form of geoengineering are being proposed by the scientific communities in the industrialized countries" (Zia 2013, xiv). These strategies entail drastic, profound and highly experimental modifications of ecological systems at a planetary scale. The majority of "geoengineering schemes seek a technical solution by experimenting with the Earth's climate regime in order to cool the planet" (Zia 2013, xiv). Examples of such schemes include "millions of mirrors in space, mega-tons of iron particles in the ocean to increase algae blooms, mimicking volcanic eruptions by putting sulfates in the stratosphere, sequestering carbon deep below the Earth's surface, brightening clouds to reflect incoming solar radiation, and mechanical (or genetically engineered) carbon-absorbing trees" (Zia 2013, xiv).

Geoengineering strategies pose massive, possibly cataclysmic risks. It is widely feared that such radical and untested "solutions… could in fact threaten, not just this country or that one, this civilization or that one, but the habitability of the planet" (Zia 2013, xiv). Many question the prudence, even the sanity, of such "mad scientist" solutions to our ecological problems. It has been argued that "while there are many 'plans B' to cope with climate change, there is no 'planet B' if (geoengineering solutions) fail" (Zia 2013, xiv). However, as the severity of the global ecological crisis becomes increasingly clear and imposing, the radical solutions of geoengineering become increasingly attractive. What once seemed like hubris and insanity begins to feel more like necessity. At the very least,

many now concede that research in to geoengineering options should be vigorously conducted today, in order to have an emergency back-up plan in the event that more conventional environmental strategies fail. Should we one day be faced with immanent and seemingly inevitable doom from ecocide, the uncertain and perilous methods of geoengineering may become our last, best hope.

Finally, ecological modernization theory recognizes that economic adjustments can provide financial and monetary incentives to produce widespread changes in the direction of ecological sustainability. They believe that "if critical resources of the Finite Earth, such as the integrity of the atmosphere and the biological diversity of life, were properly represented as a financial cost, there would be incentives towards their conservation" (Heesterman and Heesterman 2013, 4). Therefore, along with widespread adoption of improved scientific methods for industrial production, transportation and recycling, EMT proponents see a key role for market mechanisms to motivate the necessary environmental reforms. Recognizing that under the current market regime, "'efficient' production provides incentives toward the wanton over-exploitation of vital, but unpriced or inadequately costed resources", ecological modernizationists recognize that change to this economic structure is essential (Heesterman and Heesterman 2013, 4). To that end, they call for the reform of a system in which "the prevailing price structure does not… adequately include the cost of overstressing of vital capabilities of the earth" (Heesterman and Heesterman 2013, 2).

In order to rectify the ecocidal dynamics of prevalent economic logic, ecological modernization theorists suggest the implementation of "mechanisms such as tradable permits, fiscal intervention (and) eco-taxation" (Heesterman and Heesterman 2013, 161). One example of such a measure would be to "charge emission and or/extraction taxes for the use of fossil fuels and scarce irrigation water" with the hope that "being charged for the privilege of its use constrains the demand within sustainable levels" (Heesterman and Heesterman 2013, 18-19). EMT proponents also advocate "the creation of self-regulatory institutions—such as voluntary codes of corporate conduct, (eco)-certification programs and trade association sponsored standards" (Brownlee and Kueneman 2012, 61). The belief is that these "market methods" can ensure that "the allocation of resources (will) be sustainable (and) truly efficient", in order to safeguard our collective environmental future from the ravages of an unbridled consumer economy characterized by excess, waste and the squandering of precious and irreplaceable ecosystem resources (Heesterman and Heesterman 2013, 159).

An example of such market methods can be found in the strategy known as "reduced emissions from deforestation and forest degradation (REDD)" (Zia 2013, 57). REDD is a strategy that synergistically and simultaneously addresses the issues of climate change and biodiversity loss by emphasizing the conservation of tropical forests. REDD has "been conceptualized as a 'win win win' policy mechanism for mitigating climate, protecting biodiversity and conserving indigenous culture by institutionalizing payments on carbon sequestration and biodiversity conservation values of ecosystem services from global to local communities" (Zia 2013, 57). The Union of Concerned Scientists "asserts

that REDD is an option that not only averts global warming's worst consequences but also generates enormous co-benefits for biodiversity conservation and sustainable development" (Zia 2013, 57).

Essentially, REDD would work by creating "a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development" (Zia 2013, 57). The idea behind REDD is simple- "compensate developing countries for sustaining tropical forests" (Zia 2013, 58). And yet despite the simplicity of the idea, its impacts could be profound. Analysts hope that REDD will have multiple benefits, including climate mitigation, forest conservation and the protection of biodiversity and ecosystem services.

When it comes to the problem of human population growth, ecological modernization theory tends to suggest that the problem will essentially "solve itself" as the process of global industrialization progresses. Ecological modernizationists believe that as developing nations move through the process of industrialization, their birth rates will begin to decline without the necessity of specific interventions, as has been observed in the already industrialized nations such as Canada and the United States, where birth rates are much lower than in the less industrialized nations in the global South. The belief is that large family sizes are largely a strategy for securing economic security among economically disadvantaged populations, in the hope that at least some of the children will become successful and support the parents in their old age. Therefore, when economic opportunities and average family income is increased by the process of

industrialization, birth rates naturally begin to decline as strategies such as retirement savings and pensions replace large family sizes as methods of achieving economic security, until eventually the population growth falls below its replacement rate and overall population begins to decline. This is related to the idea of the "environmental Kuznets curve (EKC)" (Stern 2004). The EKC proposes that indicators of environmental degradation (including population growth) first rise, and then fall with increasing income per capita (Stern 2004). Therefore, all that is ultimately needed to achieve a sustainable human population is for developing societies to progress far enough down the path of industrialization that population growth begins to decline as per capita income rises.

When engaging with the issue of over consumption, the response of ecological modernization is twofold. First, this theory points out that as the process of ecological modernization proceeds, the environmental costs associated with consumption will begin to decrease. As industry becomes more efficient, less resources will be needed to meet consumer demand, and as production processes become cleaner less pollution and waste will be generated by the manufacture of consumer commodities. Ultimately, the theory argues that this process will reach a state of dematerialization, where production is decoupled from environmental harm, and over-consumption will no longer be ecologically problematic because goods and services will be provided without placing material demands on the ecosystem.

However, ecological modernization also recognizes the value of market mechanisms for ameliorating the harms associated with consumption in the interim period, before the end

goal of dematerialization is obtained. To that end, ecological modernization might argue that ecological and social costs of excessive consumption must be internalized into the price of unsustainable commodities, so that the driver of the gas guzzling hummer is forced to pay a substantial economic premium which will be used to address and ameliorate the social consequences of the ostentatious purchase. Fuel inefficient cars should pay more per gallon at the pump, so that they encounter rational consequences to their ecologically harmful consumer choices. Such measures are informed by "the basic assumption… that being charged for the privilege of (excessive resource) use constrains the demand within sustainable levels" (Heesterman and Heesterman 2013, 18). These "excess taxes" could then be allocated to investments in clean transportation alternatives (carpools, public transit, bike lanes) which would make possible a more rational future where ecologically sustainable transportation alternatives become increasingly feasible and attractive, with attendant ecological gains.

In summary, ecological modernization seeks to deal with the global ecological crisis by rapidly and simultaneously implementing several key initiatives. These initiatives include implementing large scale adoption of hybrid and electric automobiles, shifting on a massive scale away from fossil fuels towards clean energy such as solar, wind and tidal, cleaning up industrial processes through a carbon tax, implementing carbon capture and storage technologies, and enhancing energy efficiency through practices such as green building. Ecological modernization also points to the reduction of population growth through an environmental Kuznets curve and decoupling consumption from ecological harm through dematerialization. All of these efforts must, according to EM advocates, be

pushed forward aggressively and supported through generous economic incentives coupled with strict regulation and enforcement geared towards making positive environmental outcomes profitable. This would render green business economically competitive in a way that would push the older, polluting and exploitative industrial model into obsolescence. Should these strategies all prove insufficient, the radical and perilous methods of geoengineering are held in reserve.

Ecological Marxism Strategies

Ecological Marxists believe that only the radical transformation of society will allow humanity to overcome the challenges posed by the global ecological crisis. Foster articulates this point of view when he states that "we have reached a turning point in the human relation to the earth: all hope for the future of this relationship is now either revolutionary or it is false" (Foster 2009, 7). Essentially, ecological Marxism "argues that the engine of capitalism is a principle cause of environmental destruction and proposes "ecosocialism" as an alternative, where some form of central governance structure coordinates local initiatives" (Brownlee and Kueneman 2012, 61). The technological and scientific innovations that are key to the hopes of ecological modernization theory will ultimately be insufficient, because the basic cause of the crisis "is to be found in the capitalist mode of production", which the managerial reforms of ecological modernization leaves fundamentally unaltered. Ecological Marxism demands the abolition or transition away from the modern capitalist hegemony and the establishment of a new society, founded on the commitment to "sustainability, community and equality" (Foster 2009, 10). It is the creation of this new society that constitutes the goal

and purpose of "the ecological revolution", and it is this revolution that can save humanity from the historical dead-end of global ecocide.

In place of the shallow reforms of ecological modernization, Eco-Marxism calls for a "radical, eco-social revolution, which draws on alternative technologies where necessary, but emphasizes the need to transform the human relation to nature and the constitution of society at its roots within the existing social relations of production" (Foster 2009, 12). Eco-Marxists do not reject science and technology nor deny that green technologies will play a fundamental role in ameliorating ecological harms. However, they insist that such innovations can never in and of themselves be sufficient, because they leave unchanged the capitalist "commitment to unlimited accumulation of capital and to an order that places artificially generated private wants over individual and social needs" (Foster 2009, 12).

The disagreements between ecological Marxists and ecological modernizationists are stark. Eco-Marxists insist that "the attempt to solve our problems merely by technological, industrial or 'free market' means, divorced from fundamental social relations, is futile" (Foster 2009, 13). Without changing these fundamental social relations, any ecological gains made from improved technological efficiency are simply gobbled up again by the untrammeled consumerism and unceasing expansionism that is characteristic of capitalism. This is known as "Jevons Paradox" wherein "efficiency gains under a capitalist economy result in further accumulation and economic expansion, with the increase in scale…overwhelming gains of efficiency" (Foster 2009, 19). As long

as the capitalist economy persists, increases in economic efficiency will fail to resolve the causes of the ecological crisis, and may even exacerbate them.

According to ecological Marxism, ecological modernizationist “strategies are designed to guide society perpetually along the edge of the cliff, in line with the growth of a planetary risk economy rather than to pull back from the precipice altogether” (Foster 2009, 16). Eco-Marxism, therefore, aims to pull back from the precipice of ecological collapse, and to end our civilizational flirtation with ecocidal self-destruction.

This goal “can only be achieved by altering the economic and social order” in such a way “that the population as a whole” is finally able to “reshape society as a whole” (Foster 2009, 27). The hope of ecological Marxism is that "what the working class has so far failed to achieve might now be brought about by a rebellion of nature itself" (Benton 1996, 8). Such a grand and utopian ideal nevertheless consists of tangible and concrete steps. The first priority in this process would be implementing “immediately available solutions such as conservation and alterations in the organization of production and consumptions (such as) the promotion of mass transit over the *private* automobile (and) even more radical measures to constrain the role of marketing in promoting wasteful consumption” (Foster 2009, 27). Thus the goal of creating an eco-socialist society can be achieved through a series of incremental steps, each of which brings the final goal of a radically transformed relationship to nature closer to realization.

The ecological Marxist paradigm insists upon the necessity of “a genuine ecological

revolution, able to transform the relations between the mode of production and the ecology, which would be associated with a wider *social* not merely *industrial*, revolution, emanating from the great mass of the people" (Foster 2009, 29). This revolution would "necessarily reestablish economics as political economy, subject to class revolt and public intervention, while transforming this, in line with today's necessity, into an *ecological* political economy" (Foster 2009, 29). The resolution of the ecological crisis will come about only through, and as a result of, the abolition or transition away from of the capitalist social order that prioritizes the economic prerogatives of profit over and above all other human and ecological considerations. Ecological Marxism demands the recognition of "the ecological limits of growth and the ecological bases for a lasting and sustainable development of the forces of production", thereby creating a radically transformed eco-socialist society (Benton 1996, 140).

Specifically, the eco-Marxist transformation of society will see the capitalist global order "give way to social and cultural forces of broader orientation that put life itself at the center" (Foster 2009, 31). This ecocentric orientation gives a strong indication that ecological Marxism has much in common with deep ecology, and reveals that a strong alliance between these two perspectives is possible.

Foster argues that the project of ecological Marxists is nothing less than healing the alienation of humanity from nature through "the development of a society oriented to the creation of the 'organic person' or a system of sustainable human development" (Foster 2009, 31). From this point of view, "the long-term answers to problems of sustainability

involve the rebuilding of human community (and communities of communities), consciously incorporating a dynamic, interdependent relation to nature" (Foster 2009, 31). Such a transformation will be deep, profound, radical and far reaching, and requires substantial theoretical elaboration in order to take it beyond an inspiring ideal and into the realm of the tangible, the achievable and the immanent.

According to Foster (2009) the future eco-socialist society will be built around the ideological core of *the elementary triangle of ecology:* "(1) Social use, not ownership, of nature; (2) rational regulation by the associated producers of the metabolism between human beings and nature; and (3) the satisfaction of communal needs- not only of present but also future generations" (Foster 2009, 33). Therefore, "Marx's conception of the future… (is) one of sustainable human development in which… socialism and ecology converge, becoming one and the same" (Foster 2009, 33). The very same social transformations that will abolish inequality, exploitation and injustice, will simultaneously usher in a new era of sustainable harmony in the metabolic relationship between humanity and the biosphere.

To summarize, what ecological Marxism demands is nothing less than "a genuine ecological revolution" that will be "both a social and a cultural revolution" (Foster 2009, 34). In this vision it is understood that "the socialist goal of transcending the alienation of humanity is impossible to achieve to any considerable extent unless it coexists with the goal of transcending the alienation of nature" (Foster 2009, 34). Therefore, "socialism is ecological, ecologism is socialist or neither can truly exist" (Foster 2009, 34). The human

injustices and alienation that socialism has always struggled to abolish are finally understood as inseparable from the greater environmental alienation and exploitation of which they are ultimately a fundamental part.

Lest anyone accuse ecological Marxism of impotent utopianism, divorced from reality and therefore hopeless, it is important to point out that the eco-socialist vision for society exists already in embryonic form. We can look to "the existence today of actual societies that are simultaneously seeking to forge a socialism for the twenty-first century and also a new ecological society, of which the greatest examples today are to be found in the periphery of the capitalist world- Cuba, Venezuela, Bolivia, Ecuador, Kerala in India, Nepal" (Foster 2009, 35). These burgeoning eco-socialist experiments have "demonstrated already that the organic world is in reach in a truly revolutionary struggle for human and ecological liberation" (Foster 2009, 35).

Consequently, the eco-Marxist program for responding to the global ecological crisis hinges on "a genuine ecological revolution" which in turn "requires an end to the destructive metabolism of capitalism, embracing in its place a new communal metabolism encompassing all of humanity and the earth" (Foster 2009, 35). This vision is a challenging one, requiring not merely reform or new technological innovations, but a profoundly deep and demanding reinvention of human society as we know it. For some these radical requirements may seem daunting and overwhelming, but for eco-Marxists it is precisely the monumental nature of this project that inspires hope- only by daring to dream of a better world can we awaken from the nightmare of ecological despair that we

find ourselves embroiled in.

When it comes to the issue of human population growth, ecological Marxism is more likely than the other theories to deny that population growth per se is an environmental problem at all. In part this is because eco-Marxists tend to see this issue as a politically problematic resurgence of Malthusianism, which Marx and Engels attacked with considerable venom. They feel that framing human beings in and of themselves as "the problem" is inappropriate because it obscures the fact that the economic system of capitalism is the primary driver of environmental collapse. Ecological Marxists argue that if capitalism were replaced with a genuine ecological socialism, the world could likely sustainably support a much larger human population while at the same time repairing ecological harm. Therefore it is not appropriate to focus on restricting birth rates but rather the emphasis must be on achieving the social revolution that will bring about the birth of a human society that is in balance with nature, where the birth of children will no longer inevitably correspond to an intensification of ecological harm.

When addressing the issue of the over-consumption of the affluent, ecological Marxism points to a few related strategies. First of all, ecological Marxism points out that the same social revolution that will correct the ecocidal trajectory of capitalism will also put an end to the gross inequalities of wealth that make over consumption possible in the first place. Environmental socialism will entail the radical redistribution of wealth, so that the economic extremes of capitalism and the attendant environmental rapaciousness of the hyper-rich will become a thing of the past. The vast riches of the capitalist elite will be

confiscated and redistributed according to social need, and ecologically taxing lifestyles such as the possession of mansions and yachts will no longer be possible or tolerated. Furthermore, production processes will be socially managed in such a way only truly useful and necessary consumer products are produced, and ensures that they are produced in ecologically rational ways.

Deep Ecology Strategies

Deep ecologists take a radical stance when confronting the global ecological crisis, a stance which is summed up by the rallying cry "No Compromise in Defense of Mother Earth" (Taylor 1991, 261). Deep ecologists reject reformist approaches to environmental problems, and strongly believe that minor adjustments will never be sufficient to reverse the catastrophic trajectory of ecocide. Instead "deep ecology goes beyond a limited piecemeal shallow approach to environmental problems and attempts to articulate a comprehensive religious and philosophical worldview" (Devall and Sessions 1985, 454). This comprehensive ecocentric paradigm leads to the adoption of radical strategies for resisting and reversing environmental harms.

Deep ecologists believe in the intrinsic value and sacredness of non-human forms of life, and "certain outlooks on politics and public policy flow naturally from this consciousness" (Devall and Sessions 1985, 454). At the heart of this view is the conviction that nature, wilderness and ecosystems must be protected from degradation at the hands of human activity, and that the biosphere must be preserved and defended from all anthropogenic threats. Although they believe that ecosystems should be preserved for

their own sake, they also recognize that “if we harm the rest of nature then we are harming ourselves” (Devall and Sessions 1985, 456). Therefore, “supporters of deep ecology… recognize an overriding vital human need for a healthy and high-quality natural environment for… all life, with minimum intrusion of toxic waste, nuclear radiation from human enterprises, minimum acid rain and smog, and enough free flowing wilderness so humans can get in touch with their sources, the natural rhythms and the flow of time and space” (Devall and Sessions 1985, 456).

Therefore deep ecologists assert that “the fight to preserve and extend areas of wilderness or near wilderness should continue and should focus on the general ecological functions of these areas” (Devall and Sessions 1985, 456). They recognize that “present designated wilderness areas and game preserves are not large enough” and that the area of land set aside as ecological preserves must be dramatically increased in order to avert species extinctions and ecosystem collapse (Naess 1990, 30). The top priority of deep ecology is always “the recommendation and instigation of bold, radical conservation steps” intended to shield sacred natural spaces and the intrinsically valuable species who depend upon them (Naess 1990, 27). To this end, deep ecology leads to its "advocates doing in practice conservation work" focused on the preservation of wilderness both for the sake of essential habitats ecosystem services, but also because of the "reverence for life" that deep ecology advocates (Naess 1973, 241).

Typically “the strategy and tactics of the deep ecology movement” focus on defending nature from humanity, and to that end they favor “a boundary or limitations strategy”

which entails a “push for legislation against any development. A key term here is enduring protection (in which wilderness spaces) should be declared inviolable by the government” towards the fulfillment of “the Master Plan of (ecosystem) protection” (Naess 1990, 128). From a deep ecological point of view “nobody is entitled to destroy any part of the protected… ecosystems” and compliance with this preservation strategy will be insured through “declarations of value and value priorities- norms rules and imperatives” combined with “strong environmental policies” (Naess 1990, 32, 128). In this view, the best way to avoid harming the rest of nature is to leave it as much as possible untouched, and to protect it from human incursion and exploitation by designating these sacred spaces of high biodiversity as inviolate preserves.

Deep ecologists recognize that “global influence can only be achieved through participation in organized efforts, such as… a world conservation strategy” and that “rather strong central authorities are required to implement the national and international policies recommended by the world conservation strategy” (Naess 1990, 208). Furthermore, they assert that “to work for a more ecologically responsible personal and societal lifestyle … calls for ecopolitical… activity in each state” (Naess 1990, 45). Therefore the goals of deep ecology can only be achieved through a combination of efforts at national and international levels.

These efforts will be focused on changing key policies that “affect basic economic, technological and ideological structures. The resulting state of affairs will be deeply

different from the present" (Devall and Sessions 457, 1985). One of the most significant ways in which it will be deeply different is that the world to which deep ecology aspires will have substantially less people in it. This is desirable and necessary because "the flourishing of human life and cultures is compatible with a substantial decrease of the human population, (and) the flourishing of non-human life *requires* such a decrease" (Devall and Sessions 457, 1985).

For deep ecologists, reducing human population is an absolutely essential part of responding to the global ecological crisis. Therefore, proponents of this paradigm are unified by their "commitment to negative population growth" (Taylor 1991, 262). Deep ecologists thus argue that "if all governments set specific population targets as public policy… the current (environmental) situation could be improved" (Devall and Sessions 1985, 459). Of course, this will require imposing constraints on individual freedom to decide how many children to have, a measure that is certain to engender resistance. Nevertheless, deep ecologists are adamant that "considering the mass of ecologically irresponsible (actions) of human (beings it will be necessary to) announce a norm about what they have no right to do" (Naess 1990, 30). In this case, it will be necessary to announce that humans have no right to bear more offspring than the planet can ecologically sustain.

The restrictions deep ecologists wish to place on human reproduction would center predominantly on the populations of the industrialized world, because "given the tremendous rate of consumption and waste production of individuals in these societies,

they represent a much greater threat and impact on the biosphere per capita" (Devall and Sessions 1985, 459). At the same time as the population of these nations is being curtailed, deep ecology will also work to impose limitations on their consumption and unsustainable standards of living.

Deep ecologists might also argue that similar initiatives should be implemented to discourage ecologically harmful consumption habits such as those evidenced in choice of automobile. In the frenzy of competitive ostentation, many of the world's privileged consumers choose to purchase large, materially costly and energy inefficient "status" vehicles such as the stereotypical gas guzzling SUV or "hummer". Such extravagant purchases serve no vital needs for the consumer, who receives only a desired sense of ego-inflation and materialistic self-importance. However, the hyper-consumption of raw materials and gasoline inputs required to produce one of the luxury cars results in an unnecessary and disproportionate drain on finite natural resources and consequently cause harm to non-human lifeforms. In other words, because the affluent consumer has taken more than he needs, others will be unable to obtain the bare necessities for their physical survival. The excess of one man displaces economic injustice on the poor, who must make do with less than he or she needs because the privileged consumer was determined to have more than his or her needs required. And the toxic pollution of atmospheric particulate emitted by the excess of the rich consumer's vehicle is often inhaled by those who can afford no vehicle at all. Therefore the automobile preferences of one person translate directly into the impoverishment and ill health of the marginalized. Therefore, deep ecologists might emphasize education as a way to change

people's anthropocentric self-conception to a biocentric self-conception wherein acts of consumerist excess are seen as morally wrong, and more sustainable lifestyles are willingly adopted as a result of the spread of deep ecological values and the new ecological paradigm.

Yet even with these radical measures, "people in the materially richest countries cannot be expected to reduce their excessive interference with the non-human world to a moderate level overnight. The stabilization and reduction of the human population will take time. (Therefore), interim strategies will need to be developed" (Devall and Sessions 1985, 454).

The first of these interim strategies is what is known as conservation biology. Conservation biology is seen as being "a crisis discipline… and thus an indispensable instrument" for achieving "a substantial reorientation of our whole civilisation" (Naess 1990, 45). Conservation biology "combines insights from ecology with normative and generalist aspects to move towards this substantial reorientation. Conservation biology is the spearhead of scientifically based environmentalism" (Naess 1990, 45). It is to be undertaken by "firmly committed environmentalists with training in the life sciences who use their specialties in direct service of conservation" (Naess 1990, 45). Deep ecologists believe that the efforts of conservation biologists can help to ensure the "conservation of individual life-forms, local ecosystems, and the biosphere" (Naess 1995, xxiii). The efforts of this vanguard would "lend support to a growing international deep ecology

movement, which includes scientists, activists, scholars, artists, and all those who are actively working towards a change in anti-ecological political and social structures" (Devall and Sessions 1985, 4).

Although conservation biologists and "a broad ecocentric grass-roots effort… to achieve an ecologically balanced future" are central to deep ecology, there is another equally important component to the strategy (Naess 1995, xxi). This component is radical, militant environmentalism, as exemplified by the deep ecological activist group known as Earth First!. Earth First! Is "the militant front of deep ecology" (Taylor 2001, 182). This group "is willing to break the law to save wilderness areas- committing civil disobedience, spiking trees, removing survey stakes or destroying bulldozers, a practice they call ecotage or monkeywrenching" (Taylor 1991, 258).

These tactics are employed as part of a "concerted strategy to protect biodiversity and raise awareness" (Taylor 1991, 262). The practice of ecotage is "justified as a stalling tactic… a means to stall or prevent the destruction of wild places – to try to save some biotic diversity short-term… providing time to win legislative victories or file lawsuits" (Taylor 1991, 264). Furthermore, "monkeywrenching can actually prevent destructive activity already underway – driving the worst earth destroyers right out of business- erasing their profits by slowing their work and destroying their tools" (Taylor 1991, 264). In this way radical deep ecologists strive to "do their part in thwarting industrial destruction" of the ecosphere (Taylor 1991, 264).

Deep ecology's primary response to the ecological crisis is to "simply state that natural diversity-building for three and a half billion years- should be left unfettered" by human exploitation and preserved through the extensive designation of wildlife preserves (Foreman 1998, 443). In the deep ecological strategy "the preservation of wilderness is the fundamental issue" along with "a recognition that there are far too many human beings on Earth". Deep ecology also holds the conviction that "there is an unconscionable misdistribution of wealth and the basic necessities of life among humans", and both of these problems must be aggressively corrected through the inculcation and application of ecocentric values. The stance of deep ecology is both radical and uncompromising, arguing that "in everything human society does, the primary consideration should be the long-term health and biological diversity of Earth... Earth comes first" (Foreman 1998, 443).

In summary, deep ecological strategies for responding to the global ecological crisis center around reducing the human population, radically increasing the conservation and preservation of wilderness areas and ecosystems, international cooperation and state-level ecopolicy, the practice of conservation biology, the development and mobilization of a powerful ecocentric grassroots and the practice of ecotage and extra-legal direct action aimed at preventing the industrial devastation of nature and non-human species

Chapter 7: Solutions to the Global Ecological Crisis

In the final section of the thesis, I will discuss five general strategies for environmental reform that may hold the key to overthrowing the current hegemonic system and discourse of ecocide. In addition to the strategies already discussed, they may help provide a bright and fruitful future for an ecologically-rationalized human society. Such a transformed society may approach the status of utopia by challenging and ultimately overcoming the hegemony of ecocide that has led us to the very precipice of a nightmarish dystopianism.

General Strategies for Environmental Action

Having recognized the extent and severity of global environmental harm, we must strive to identify strategies for bringing about environmental reform and improvement. The essential question is "how societies can find their way out of the "iron cage" of environmental despair" (Buttel 2000, 307). According to Frederick Buttel, there are four basic mechanisms for bringing about a transformation of society which will bring to an end ecocidal practices and allow us to avoid the ecological catastrophe towards which we are headed. These include "environmental activism, state environmental regulation, international environmental governance and green consumerism" (Buttel 2000, 306). Each of these mechanisms implies a slightly different conceptualization of ecological harm and each offers different proscriptions for its management.

The first strategy emphasizes the "mobilization of environmental movements, particularly

"new" or novel movements that expand on…mainstream environmentalism" (Buttel 2000, 309). The second approach aims at "sustaining or enhancing the environmental regulatory capacity of governments". The third paradigm is based on the belief that "the most efficacious route to environmental protection is through international environmental agreements, international environmental regimes and international intergovernmental organizations" (Buttel 2000, 309). The fourth and final strategy stresses "reduced consumption on the part of individual consumers" and "the exhortation of individuals to consume less or to buy green products such as organic food or recycled paper" (Buttel 2000, 333). In the following chapter, each of these strategies is given critical attention.

Environmental Movements

The environmental movements orientation assumes that "the overarching mechanism for achievement of environmental integrity revolves around the role of environmental social movements" (Buttel 2000, 309). The presumption is that when these movements achieve a critical mass they will inevitably catalyze national environmental legislation and regulation. However, there are some obstacles to the success of this kind of approach. One obstacle is that green social movements are increasingly opposed by "environmental counter-movements" such as the so called "anti-environmentalist movement" (Buttel 2000, 309). This anti-green movement consists of a coalition of interest groups such as "the Property Rights Movement, the Business Roundtable and the Global Climate Coalition that fought to prevent the U.S. federal government from cooperating with the Kyoto Protocol" (Buttel 2000, 310). These groups represent "well-funded anti-environmental organizations" which are supported by "private corporations or by

conservative philanthropies" (Buttel 2000, 311). The anti-environmentalist movement "has developed a persuasive ideological position" in which they argue that "the problem is more so environmental alarmists than it is environmental problems and that the market is already doing a sound job of allocating resources" (Buttel 2000, 310).

Regrettably, we have seen that "through systematic disinformation campaigns, corporations and their public relations representatives have successfully downplayed the severity of the crisis, including how it is linked to modern socioeconomic arrangements" (Brownlee and Kueneman 2012, 68-19). Despite these obstacles, there is hope that environmental movements will lead to increased "public awareness of environmental problems" which will in turn "lead to citizen mobilizations" in a cycle of activism and education that will eventually reach critical mass and transform society. There is also hope that "as industrial societies become increasingly affluent, the growth of the educated middle class will increase the base of support for environmental protection (Buttel 2003, 310). Ultimately, it is hoped that "the actions of (environmental movements) would be based on a robust set of eco-sensitive criteria and specifically encourage the participation of the majority in line with grassroots ecological democracy" (Brownlee and Kueneman 2012, 68).

According to Buttel, there were only two major types of environmental movement organizations in existence until the 1960s. The first category includes "preservation groups" such as the Wilderness Society and the Nature Conservancy, who advocate "the

preservation of wilderness and other natural areas" (Buttel 2000, 311). The second category is termed "conservation groups", and includes such organizations as the Audubon society and the National Wildlife Federation. These groups advocate "the reduction of resource waste through proper management and the application of science to natural resource policy making" (Buttel 2000, 311).

In addition to these two early archetypical pro-environmental discourses, there are four "major new types of environmental movements that have emerged…over the past (43) or so years". These new social movements "include the ecocentric, political ecology, deep ecology, and ecofeminist discourses". To this I will add a fifth and sixth: The grassroots and environmental justice movements. Each will now be discussed in turn (Buttel 2000, 312).

Examples of ecocentric environmental groups include Zero Population Growth, the Natural Resources Defense Council and the Cousteau Society. These groups "adhere to the view that natural systems are the basis of humanity, that human survival is linked to eco-system survival, and that human ethics should be guided by ecological responsibility" (Buttel 2000, 312).

The discourse of political ecology, on the other hand, is "guided by a view that the domination of humans by other humans leads to the domination of nature and that

political and economic power creates major environmental problems". The solution to these ecological problems therefore "requires fundamental social change based on empowering subordinate groups such as local communities and poor people" (Buttel 2000, 312). This form of environmental movement is closely related to the theoretical perspective of ecological-Marxism that has already been discussed. It is mentioned here simply to emphasize the role that ecological-Marxists play as activist members of on-the-ground environmental movements.

Overlapping with ecocentric activists, deep ecology groups are those which base themselves "on the fundamental principle that the richness and diversity of all life-including nonhuman life forms- have value and should be protected and that human life should be privileged only to the extent required to satisfy humans' vital needs" (Buttel 2000, 312). Environmental movement organizations based on the deep ecology platform include Earth First!, Wild Earth and the Rainforest Action Network. Again, although deep ecology has already been discussed as a theoretical paradigm, it is briefly mentioned again here to demonstrate that deep ecology is not only a philosophy or a theory, but also a living movement of concerned, socially activated citizens struggling for environmental change.

The final primary group discussed by Buttel is ecofeminism, which is predicated "on the notion that ecosystem destruction is based on androcentric or patriarchal concepts and institutions and that eradication of androcentric institutions is the lynchpin of solving

environmental and other social problems" (Buttel 2000, 312). Primary examples of ecofeminist organizations include Women in Environment and Development and Women in Defense of the Environment.

A fifth kind of environmental group is that which Buttel calls "the grassroots environmental movement". This group he describes as "a particular, highly activist, component of the groups that operate mainly in particular communities or regions" (Buttel 2000, 312). A primary substantive concern of the grassroots environmental movement is "toxic chemical and related issues" such as the placement of toxic waste dumps, the danger posed by radioactive wastes, the contamination of local water supplies and the placement of hazardous waste disposal facilities and incinerators" (Buttel 2000, 312).

A sixth distinct movement is "the environmental justice movement", which Buttel sees as "a particularly innovative and prominent form of the grassroots environmental movement" which has its roots in the "civil rights, social justice and environmental movements" (Buttel 2000, 313). The primary claim of the environmental justice movement is that "many types of environmental destruction- particularly those involving toxics, pollution of the workplace, and polluting factories, waste dumps, and nuclear processing facilities- tend to have their most adverse impacts on minority communities and the poor in general" (Buttel 2000, 313). This perspective sees environmental harm as an issue of social equity and civil rights, and equates environmental reform with "social

and racial justice concerns" (Buttel 2000, 313).

It also important to note the extent to which environmental social movement organizations have begun to form partnerships, coalitions and alliances with other groups such as the anti-globalization movement, the labor movement, the sustainable agriculture movement, the genetic resources conservation movement, the human rights movement, the anti-biotechnology movement and others (Buttel 2000, 313). The importance of these new multi-movement coalitions is best illustrated by the iconic "Battle in Seattle" protests against the World Trade Organization in 1999. This development is important because it raises the possibility of a new, global movement consisting of multiple components who through the creation of a broad alliance manage to transcend their individual limitations and become part of something greater than the sum of its parts-something that might achieve substantial gains for ecological preservation while fighting for other worthy causes at the same time.

Environmental social movements are united by three major factors. First, in all their forms, environmental social movements shape human identity. Second, they serve to build and generate political momentum. Third, they place pressure on state officials and private decision makers to respond to the environmental agenda (Buttel 2000, 313). The core of the environmental social movement philosophy is the idea that because "there is a strong tendency for private interests to favor expansion of production and consumption, there must be a constant political pressure from mobilized citizenries to keep public as

well as private decision makers environmentally accountable" (Buttel 2000, 313). The hope is that environmental social movements can one day provide that pressure, and serve as part of the hand on the rudder of modernity, guiding the forces of economic, technological and scientific progress in the direction of ecological sustainability. I would argue that Greenpeace is a primary example of such a social movement, which plays an important role in framing the discussion of environmental issues, keeping the environment on the public and media radar, and activating social campaigns against both global and specific ecological problems.

State Environmental Regulation

Many scholars have argued that in order for humanity to enjoy a survivable environmental future, it is essential that "government or state regulation of environmentally related private decision making, particularly by industrial corporations" is increased and extended. Therefore, a major "approach put forward to reduce ecological harm is enhanced state regulation" (Brownlee and Kueneman 2012, 61). From this viewpoint, the claim is that states can and should discipline markets by, for example, forcing companies to invest in alternative energy sources, greener technologies, and eco-friendly industrial practices. In theory, state regulation would mandate corporations to pay the costs that they would otherwise externalize, thereby reducing their willingness and capacity to cause harm" (Brownlee and Kueneman 2012, 61).

The attempt to protect natural environments has usually been closely aligned with the supporting and catalytic efforts of government agencies and officials. Certainly "one approach to protect the (environment) has been to prohibit its abuse and destruction by government legislation" (Brownlee and Kueneman 2012, 62). It has frequently been the case that the major "impetus for conservation programs often comes from within the circles of government power. For these reasons, it has been argued that the rise of the environmental regulatory state has come to be one of the central defining features of the … modern form of liberal democratic government in Western countries" (Buttel 2000, 316). Continuing this trend by strengthening the regulatory capacities of state governments is therefore one promising avenue for responding to the global ecological crisis.

Buttel argues that we should not discredit or discount the substantial environmental achievements that have been accomplished by the governments of states. For example, "there was great progress during the 20th century in adding and protecting wilderness, forests and sensitive habitats within nature reserves… also…there has been considerable progress in air and water pollution control (and) workplace health and safety" (Buttel 2000, 317). As a result, a broad consensus has emerged to the effect that "the only way to realize societal demands for high environmental quality and minimized environmental risks (is) for a stronger state to better counterbalance the power of corporate capital" (Buttel 2000, 317).

This point of view argues that "the active intervention of the nation-state in the essential economic decisions in the private sector (is)… the only plausible remedy" for the reckless environmental harms inflicted by corporations (Buttel 2000, 317). This argument emphasizes the "necessity of an interventionist environmental state", as "the government or state is the only institution with the ability, and thus ultimate responsibility, to make possible what might be called the (ecological) rationalization of society" (Buttel 2000, 318).

According to Buttel (2000) "a society's ability to make possible environmental protection is essentially a function of the nation-state's capacity to enact and implement regulations of private behaviors" and thus "the development and maintenance of the state's capacity to regulate private resource decision making comprises the critical factor in our environmental future" (318).

Unfortunately, the role of the state as a primary driver of environmental protection has been severely compromised by the rise of "conservative regimes" which are "heavily inspired by neoliberal scholars who argued for and legitimized strong deregulation and privatization programs" (Buttel 2000, 318). Therefore, in the face of a system which subsidizes the consumption of resources and the protection of rights to private property, the future of state-led environmental regulation has come under considerable doubt (Buttel 2000, 319).

The role of states in orchestrating substantial ecological transformations in society has been brought into questions by critics who point out that "the conventional form of environmental control- what is often referred to as 'command-and-control' regulation- is increasingly seen as being outmoded" (Buttel 2000, 319). This is because such regulation is limited to setting standards for "end-of-the-pipe" emissions of pollutants and therefore "offers little or no incentive for firms to make innovative changes in their production practices", leading some to decry state intervention as inefficient and inflexible (Buttel 2000, 319).

In recent years, notable enthusiasm has been generated around regulatory innovations such as the application of the "precautionary principle" to decision making processes (Buttel 2000, 321). This principle is seen as having an extremely important role to play in the approval and regulation of new drugs, chemicals and foods. The precautionary principle transfers the burden of proof away from state regulatory organizations and towards private corporations. Therefore, under the precautionary principle, it is not incumbent on governments to demonstrate that a new practice or product is unsafe, but rather it is the obligation of the private company to prove that it is not harmful.

In practical terms, the application of the precautionary principle can involve the issuance of "assurance bonds", which are bonds based on the occurrence of a worst-case scenario. In the event that such a "worst-case scenario" comes to pass, the assurance bonds would

be forfeited if there are demonstrated to be costs and damages associated with a certain practice. On the other hand, firms would be reimbursed the value of their bonds, plus interest, in the event that harmlessness was proven over time (Buttel 2000, 322).

A further suggested measure "is for the state to create new institutions to counterbalance corporate activity, namely common property and common property trusts. To better protect the use of the commons" (Brownlee and Kueneman 2012, 63). The hope is that "these newly created institutions would serve as counter forces to capital and undertake various activities to protect the air, water, soil, fisheries, biodiversity, and other elements of the commons" (Kueneman and Brownlee 2012, 63). As part of this process, "the state would be responsible for financing the reacquisition and restoration of previously privatized pieces of the commons and transforming them into common property" (Brownlee and Kueneman 2012, 62). By doing so, it would be possible to liberate essential ecological goods such as "air, water (and) ecosystems from the destructive grip of private capital, in order to protect the ecosphere and the human communities who depend upon it" (Brownlee and Kueneman 2012, 62).

The importance of the commons as a vehicle for the preservation of the biosphere is explained as follows: "If the corporate sector devours nature, the commons sector would protect it. If the corporate sector widens inequality, the commons sector would reduce it. If the corporate sector turns us into self-obsessed consumers, the commons sector would reconnect us to nature, community, and culture" (Barnes 2006, 65-66). The reclamation of ecosystems from the corporate sector and the transformation of the corporate sector in

to the commons is therefore one of the most promising strategies for the preservation of the biosphere. The state is seen as the most logical actor to enact this reclamation, and the expansion and protection of the commons is therefore at the heart of the paradigm of state environmental regulation. To summarize, “the solution (is) to “reclaim the commons … for the state to create new institutions to counterbalance corporate activity, namely common property and common property trusts” (Brownlee and Kueneman 2012, 63).

International Environmental Governance

We have already seen that the ecological problems confronting humanity are global in scope and universal in consequence. It is for this reason that international environmental governance has become an important strategy for responding to the planetary crisis of the biosphere. The strategy of international environmental governance is known as *environmental internationalism*- "the notion that due to the intrinsically global scale of environmental problems and the importance of globalized socioeconomic institutions, the most efficacious route to environmental protection is through international environmental agreements, international environmental regimes, and international intergovernmental organizations" (Buttel 2000, 315). This is based on “the presumption that human beings are under a duty of care to protect the natural world and the integrity of the earth and its ecosystems” and therefore “the creation of legal frameworks to enshrine this obligation in international law is a logical step” (Heesterman and Heesterman 2013, 170).

Environmental internationalism is the effort to bring about an apparatus of *global environmental governance,* “tied inextricably to collective action, problems and efforts at

solutions" (Stoett 2012, 7). Global governance… "encompasses any process of decision and rule making and policy implementation at the local, national, regional and global levels that addresses (environmental) issues of international or transnational concern" (Stoett 2012, 7). The importance of international environmental governance does not rest on the belief that "a world government or even strong supranational regional governance will form any time soon", although the severity of the global ecological crisis may indeed present a strong case for the creation of such a body (Stoett 2012, 7). Nevertheless, we can and must "forge multilateral arrangements in our efforts to curtail environmental harm", even if we must "do so in the absence of a reliable…centralized mechanism", at least for now (Stoett 2012, 7).

Recognition that planetary problems require global solutions has come about through engagement with issues "such as global warming, atmospheric ozone depletion, loss of biodiversity, and transboundary movement of toxic wastes" (Buttel 2000, 328). Attempts by any one state to address these issues is doomed to failure if other states continue to destroy habitats, dump toxins or pollute the atmosphere with impunity, and the highly fluid and mobile nature of transnational capitalism allows ecocidal corporations to evade ecological regulations in one nation by relocating to other areas where similar laws have not been enacted. Therefore, only binding agreements that are internationally negotiated and global in scope can truly solve many environmental problems- rather than simply geographically redistributing them. To that end, many have proposed "the creation of a global governance framework capable of protecting the well-being of present and future generations and of nature" (Heesterman and Heesterman 2013, 171).

The aspiration of global environmental governance as a strategic response to the global ecological crisis is that the "sum of all these efforts will… eclipse their parts, and a new era will emerge whereby we overcome our planetary anxiety by establishing newfound security and purpose in a reliable… global context" (Stoett 2012, 7). Another term for this vision is "*global ecopolitics",* a visionary term that "conveys the inherent complexity of the task: the centrality of collective action problems, the wide range of actors, the technological and scientific challenges and opportunities, and the need for both leadership and widespread legitimacy" (Stoett 2012, 7). Such concerns may make the project of global eco-governance seem daunting, but the dream of creating a system of "reliable, adaptive, just governance" of ecological issues is compelling enough that we must elucidate "the structures and processes that…help us on that path" (Stoett 2012, 8).

Buttel (2000) argues that there has been a "clear trend in recent decades toward seeing our environmental future as being premised on our ability to deal with these global-scale ecological processes and concerns", and international environmental governance has emerged in an attempt to build the necessary regulatory infrastructure for meeting these challenges (327). Two highly influential books are credited with giving environmental internationalism its major impetus-*The Population Bomb* by Paul Erlich and *The Limits to Growth* by Meadow et al. *The Population Bomb* "popularized the notion that there exists a global population, with its own global dynamics, and that the essence of the human role on the Earth is that this global population is threatening planet wide Malthusian-style environmental catastrophe" (Buttel 2000, 327). Shortly afterwards *The Limits to Growth*

argued that because of the strong tendency for economic expansion to lead to insoluble pollution and resource depletion problems, there was a need to adopt “limits to growth” policies at a global level" (Buttel 2000, 328). This influential work made the case that “the earth itself and its global physical processes pose essential restrictions, both on the numbers of people and affordable living standards (and) there no longer is any virgin land to be appropriated without harming others, if that ever was the case” (Heesterman and Heesterman 2013, 17).

The Limits to Growth made it clear that there are many “resources, crucial to the well-being of humanity, which have a finite limit that cannot be exceeded without incurring serious adverse effects” (Heesterman and Heesterman 2013, 17). These two books had a profound influence on world leaders and played a substantial role in the deliberations at the Stockholm Conference on the Human Environment in 1972 and the 1974 World Population Conference at Bucharest, Romania.

These initial attempts to formulate international environmental accords were substantially inhibited by tensions between the global North and South. The South feared that the new green discourse, which identified population growth and development as the major factors in ecological degradation, would implicitly lay the blame for future environmental problems on the developing countries and their industrial aspirations. However, this stalemate was temporarily discursively overcome by "the appointment of the World Commission on Environment and Development (WCED) by the secretary-general of the United Nations in the early 1980s" (Buttel 2000, 327). A primary product of the WCED

was *Our Common Future*, a book which "played a highly influential role in popularizing the notions of sustainability and sustainable development" (Buttel 2000, 327). Sustainable development was seen as a compromise position which argued "that the contradiction between economic growth and development could be diminished very substantially if new growth was harnessed in a sustainable development framework" (Buttel 2000, 327).

The WCED had erected the scaffolding for a global regulatory regime organized around the principles of sustainability and sustainable development as the way forward on "global-scale problems such as deforestation, loss of biological diversity, desertification, soil and land degradation" and the "master global environmental issue" of climate change (Buttel 2000, 327). The contributions of the WCED to environmental internationalism were substantial, and in many ways it paved the way for the 1992 Rio Earth Summit. What was emerging was "a hopeful pattern of international collaboration and agreement" which was further reinforced by the major successes achieved by the 1987 Montreal Protocol "in reducing the introduction of chlorofluorocarbons into the stratosphere and in making possible a reduction of the rate of depletion of the stratospheric ozone layer" (Buttel 2000, 329). This kind of encouraging progress bolstered the belief that international agreements and treaties combined with multinational regulatory organizations and regimes offered the best hope for achieving a brighter ecological future.

Environmental movements also embraced the international approach, which offered several advantages over more traditional grassroots and "not in my backyard" styles of organizing. A major attraction was that "focusing on global-scale problems, particularly if these problems could be connected with suggestions that future global-scale environmental disasters might occur, could be an effective strategy for environmental groups to obtain media attention and to multiply their impact" (Buttel 2000, 329). More importantly, "global strategies… provide a way for environmental groups to multiply their impacts on policy" so that "instead of environmental groups' having to contest policy decisions in every capital city across the world, successful passage of a global-scale agreement could, in one fell swoop, leverage governments across the world to implement new environmentally friendly policies" (Buttel 2000, 330). The global turn in environmental thinking was revolutionizing the struggle against ecological degradation.

In practice, environmental internationalism has two major components. The first component is *international environmental regimes*- "which are systems of norms and rules specified in a multilateral agreement among signatory states to regulate actions on a specific issue or set of issues" (Buttel 2000, 330). Regimes typically incorporate some legally binding instrument or agreement, the most common of which is known as a *convention*. A convention is a binding instrument that includes all the negotiated legal obligations along with a comprehensive formal inventory of relevant rules and norms. The second primary mechanism of environmental internationalism consists of *international governmental organizations* (IGOs). Environmental IGOs "are intergovernmental organizations formed for some specific purpose in relation to the

environment. Important environmental IGOs include UNCED, the United Nations Environment Programme (UNEP), and the United Nations Commission on Sustainable Development (UNCSD)" (Buttel 2000, 330). These organizations assume responsibility for monitoring environmental indicators, raising public awareness, implementing programs and in some cases enforcing compliance with binding conventions.

Taken together, international environmental regimes, legally binding conventions and international governmental organizations represent one of the most important directions for humanity's struggle to adapt to and survive the global ecological crisis. Yet major challenges undoubtedly still exist. For example, international negotiations are still hampered by ongoing north-south divisions, and IGOs are often opposed by even larger and more powerful anti-environmental organizations (such as the WTO). Nevertheless the global mentality and transnational reach of environmental internationalism remains indispensable to the cause of ecological survival. The primary drivers of ecological harm are transnational and therefore lasting solutions will require global co-operation and enforcement on a planetary scale.

The legal basis for this enforcement might rest in part on “the proposal that the destruction of the environment should feature under international law as the Fifth Crime Against Peace alongside Genocide, Crimes Against Humanity, Crimes of Aggression and War Crimes” (Heesterman and Heesterman 2013, 172). The hope is that “threats against the planet could be tried as Corporate Ecocide at the International Criminal Court in the same way as other Crimes Against Peace” (Heesterman and Heesterman 2013).

Egregious acts of ecocide such as “the Athabasca tar sands and the Deepwater Horizon oil spill” should be treated as crimes and the responsible parties should be held to account in an international court of law, in order to act as a deterrent against future environmental harms (Heesterman and Heesterman 2013, 172). Without such measures, there is little incentive for corporations to take account of ecological concerns in their operations and future environmental disasters will be inevitable.

From this perspective, “the most logical way to (protect ecosystems) on a global scale would be for the United Nations to act as a world government with powers to charge emission and or/extraction taxes for the use of fossil fuels and scarce irrigation water. These charges/taxes could be spent on activities such as ... funding projects aimed at containing climate change or mitigating its socially disruptive consequences” (Heesterman and Heesterman 2013, 19). It is hoped that this form of international political regulation would provide “a coherent and effective mechanism of global government” with the capacity to rise to the unprecedented challenges posed by the planetary ecological crisis (Heesterman and Heesterman 2013, 19). The belief is that “if a world government of this nature could become a reality in combination with a meaningful measure of democratic accountability, it would be a logical solution, advantageous to humanity’s collective security as well as fair” (Heesterman and Heesterman 2013, 19).

Green Consumerism

A fifth strategy for environmental reform emphasizes the personal and individual choices that people in society make regarding what to purchase and consume. The idea of green consumerism is that substantial ecological improvements could be made if the public would exercise discretion in purchasing only those products which are environmentally sustainable, and refrain from buying anything that carries a negative ecological cost. As simple a decision as what kind of dish detergent to use can have considerable consequences- high phosphate soaps will create eutrophication effects in water bodies, choking out marine life under a thick mat of algal bloom. If enough people choose to buy phosphate free soaps, this problem could be substantially reduced, even eliminated. Countless examples exist- dolphin friendly tuna, products with biodegradable packaging, cleaning products made without toxic chemicals, organic produce and non-GMO foods. Each in its own way is more environmentally benign than less "green" market alternatives.

There can be no doubt that the overall impact of any one exercise in green consumerism seems trifling when compared to the planetary regulatory regimes enacted by environmental internationalism. But when the modest gains made by a single individual are extrapolated to thousands, millions or tens of millions of people, ecological benefits become considerable. If a whole city or nation can be induced to buy pesticide free foods, the reduction in toxic pollution to the environment may be considerable, and if practices such as drinking bottled water become stigmatized as anti-ecological, millions or billions

of plastic bottles may be diverted from landfills and oceans. The idea of green consumerism, therefore, is that each individual, acting as an autonomous agent, can exercise his or her green values in the market place, voting with his or her dollars to support companies that make ecological improvements and boycotting those whose practices are particularly egregious.

The concept of green consumerism has become highly influential, to the extent that "stressing reduced consumption on the part of individual consumers… is perhaps the single most common environmental reform strategy advocated by environmentalists and environmental scientists" (Buttel 2000, 333). There are many advantages to the practice of green consumerism. By placing the onus of responsibility on individuals in society rather on global or nation level decision makers, green consumerism provides a sense of empowerment and accountability to every person. It allows people to exercise their environmental values in their day to day lives, and thus alleviates the sense of alienation that many people feel when confronted by the monolithic and inscrutable decision making processes that otherwise seem to determine their future and that of the Earth.

For these reasons, "a number of environmental sociologists… have argued strongly about the need to take consumption and individual consumption processes seriously" and this has in turn given rise to "the attention now given to green products and green marketing" and the "role that consumer behaviours and green marketing will play with regard to our environmental future" (Buttel 2000, 333). Even the most enormous system is composed

of component parts, each of which in its own small way contributes to the structure of the system itself. And every action, no matter how small, has ramifications and consequences that are real and significant. A single plastic sheet of beer-rings can choke a duck or goose, and a single plastic bottle of water consumed in a workplace or a classroom sends a message to those nearby- sustainability does not matter. By contrast, the effect of every green consumer choice is two-fold: first, the green choice has tangible benefits such as reduced pesticide volume or diminished plasticization of the oceans. Second, and perhaps more importantly, it sends a message- to the self, to peers, to fellow citizens and to the companies who manufacture and sell products: that ecological benefits are important and worth paying for.

Nevertheless, "there have been a number of environmental sociologists who have argued that the exhortation of individuals to consume less or to buy green products such as organic food or recycled paper is an ineffective means of securing environmentally friendly social changes" (Buttel 2000, 333). It has been argued that the amount of material and energy that is actually accounted for by individual consumer choices is minute by comparison to the vast systemic infrastructures of production and transportation which gobble up the lion's share of resources and generate the vast majority of waste and pollution. Therefore, some scholars have "stressed that environmental movements need to focus on changing the rules of production institutions rather than trying to influence consumer purchasing decisions" (Buttel 2000, 333).

As Buttel (2000) points out "most of the energy and materials consumption… is accounted for outside of the sphere of household consumption (i.e., by corporations and governments and in the transportation and circulation of non-consumer goods) and is thus largely beyond the purview of the individual consumer to influence" (333). Furthermore, the fundamental physical infrastructure within which individuals make consumer decisions sharply curtails their freedom to select ecologically friendly alternatives. The decision to ride a bike instead of drive a car, for example, is highly advantageous from an environmental point of view, but is often almost completely impracticable for residents of vast, sprawling metropolitan cities that lack bike lanes. Even the best intentioned potential green consumer is often foiled by the pre-existing material conditions in which he or she exercises individual choice.

Therefore, some have concluded that "voluntary limitations on consumption or green consumerism would involve little more than a drop in the bucket compared to the huge flows of resources that are shaped by public policy through its effects on the transportation system, the urban infrastructure, and the character of the built environment" (Buttel 2000, 334). If we ignore the massive ecological impacts of vast production industries, the enormous resource-greed and pollution associated with war-making and the military and the monstrously inefficient and carbon-intensive system of automobile based transportation, all the recycled toilet paper and biodegradable packaging in the world will not save our species from ecocidal self-destruction.

All of these criticisms are valuable and accurate in their own right. And yet we should be careful not to glibly dismiss green consumerism as irrelevant to real ecological reform. The truth remains that even small decisions have real and tangible effects, and that small effects in sufficient numbers can have a snowball effect that is ultimately greater than the sum of its parts. Although green consumerism alone will not be sufficient to stave off the worst effects of the planetary eco-crisis, it can still play a real and important role in creating a more sustainable environmental future. In some cases green consumerism has made significant headway in shaping the production practices of major corporations, through a process of dialogue and the mobilization of public pressure. In a competitive economy corporations cannot ultimately afford to ignore the sentiments and desires of their customers, and if ecological consumption behaviours reach a critical mass the major drivers of industry can be forced to respond.

The effectiveness of coordinated green consumer campaigns has been demonstrated by "several… environmental groups such as Friends of the Earth" who "have made major gains by targeting specific industrial corporations that play strategic roles in making possible beneficial, industry-wide changes; typically, these environmental groups target an industry leader (such as Siemens in electronics) and raise the threat of mobilizing consumer boycotts as a strategy to secure voluntary corporate agreement to undertake an environmentally friendly change in production practices" (Buttel 2000, 334). These campaigns can have wide-reaching effects. For example, by generating unfavourable publicity environmental groups have successfully pushed major corporations such as Nike, Mattel and Coca-Cola to change the way they do business in substantial ways that

have an enormous impact when the scale of these corporations is taken into account. The producers of "Barbie" dolls have been shamed into changing their packaging sources (which had previously been destructive of rainforests) and the makers of "Nike" shoes were convinced to adopt less toxic chemical production methods. When green consumerism passes a critical threshold it can have a transformative effect on production practices which can in turn create a ripple effect in industry as other corporations strive not to be left behind.

Sadly, the potentially transformative effects of green consumerism are often hindered by the dishonesty and duplicitous nature of corporations and advertising. This problem is known as "greenwashing" and refers to all the ways in which companies attempt to package their products as ecologically friendly without making any substantial changes to the material ways in which those products are produced. Therefore, scholars "have noted that as much as many consumers would welcome new products that involve major reductions in the use of resources or in pollution levels, green products are typically more matters of corporate public relations than they are significant improvements in an ecological sense" (Buttel 2000, 334). Many consumers lack the habits of critical thinking, research and eco-literacy that are required to distinguish genuinely eco-friendly products from those which are simply masquerading as green. Therefore, there is a risk that "the significance of green consumerism lies more in corporate image enhancement or, in other words, in greenwashing than in reduction of resource consumption or pollution" (Buttel 2000, 334).

Greenwashing is an impediment to the potentially substantial ecological gains that can be attained through coordinated campaigns advocating green consumerism. Nevertheless, this is not an insurmountable obstacle. In reality, consumers navigate numerous similar challenges in their day-to-day lives. For example, a potential home-owner or someone in the market for a new car will have to navigate numerous contradictory claims, each trying to convince the consumer that it offers "the best deal" or the "lowest price". There is a bewildering array of incentives, gimmicks, deals and bargains on offer, and the only way to make a truly financially prudent decision is through critical thinking and research. The same holds true of health claims. Products may loudly advertise that they are "high fibre" while at the same time being high in sugar, or may claim to be "low in fat" yet full of harmful chemical preservatives. Some consumers are acclimatized to a complex, confusing and dishonest global marketplace and have therefore developed critical skills which make them shrewd and canny in their hunt for the healthiest meal and the lowest price. The same skills that consumers bring to bear when trying to save money or avoid fat will also enable them to distinguish "fake" ecological claims from those that are substantial.

Of course, many consumers are definitively *not* particularly shrewd, and therefore there are strong reasons for governments to intervene by passing legislation that prohibits corporations from engaging in direct or implied false advertising and that penalizes attempts to convey false ecological messages. By establishing standards in environmental advertising, state governments could substantially eliminate greenwashing as an obstacle to consumer driven ecological reform.

Sadly, however, governments themselves are often in the business of greenwashing. A key example can be found in the Conservative government in Canada today and its approach to greenwashing the Alberta tar sands and oil pipelines to the US and the BC coast. It is therefore difficult to have any confidence that governments can be relied on to work toward eliminating greenwashing, at least without substantial and sustained pressure from environmental movements and ecological organizations.

In summary, "although there are limits to the role that individual- or household-level green consumerism can play in creating a sounder environmental future, consumption will become an increasingly important component of environmental improvement in the future" (Buttel 2000, 335). At the end of the day, the most significant contribution of green consumerism may be to cultivate a culture of ecological responsibility and a sense of personal accountability that brings environmental issues into the day-to-day life of individual people. By exercising their consumer freedom in order to choose products that are less damaging to the planet, people may reconnect with a sense of empowerment that is often lost in a world of vast eco-calamities that seem far beyond the scope of individual actions to change. And although it may indeed be the case that individual consumer choices amount to little more than "a drop in the bucket" of global environmental harm, it is also true that every bucket is filled one drop at a time. The brightest hope of green consumerism is that small choices will snowball. The decision of one individual to buy

recycled toilet-paper may well influence that person's friends and family, who may in turn pass this new consumer ethic on to their own social networks. If such peer-to-peer spread of green behaviour reaches a critical threshold, large scale corporate producers will respond in ways that may be transformative.

Chapter 8: Summary and Conclusions

In this thesis, we began by noting that the planet Earth is embroiled in a global environmental crisis of potentially apocalyptic magnitude. This crisis was analytically divided into two major parts- climate change and biodiversity loss. It has been demonstrated in earlier chapters that the consequences of this global environmental crisis are profound and severe, to the extent that they pose an existential threat to humanity. Therefore, resolving this problem has become the best and last hope of the human species. In order to answer the first research question (what is the *cause* of the global eco-crisis), we have turned to our three primary theoretical perspectives. Ecological modernization theory tells us that the root cause of the environmental crisis is outdated technology, inefficient managerial methods, outmoded infrastructure, and antiquated application of scientific technology. Ecological Marxism, on the other hand, identifies the root cause of the problem in the fundamental contradiction between the unending profit and accumulation model of capitalism and the finite and fragile nature of the planetary ecosphere. Finally, deep ecology has argued that an anthropocentric world view, closely wed to the dominant western world view, has promulgated an instrumental view of nature that leads to the denial of intrinsic value and thus the wholesale over-exploitation of non-human life forms.

In addition to these three theoretically informed causes of the global ecological crisis, we can also identify the human population explosion and the rising levels of individual consumption as essential primary drivers of ecological collapse. Drawing on this

knowledge, the thesis identified five fundamental causes of global ecological crisis: 1. inefficient and polluting technologies and outdated industrial infrastructure, 2. The exploitative and unsustainable metabolic processes of capitalism which create a rupture between the demands of capital accumulation and the needs of a finite and fragile ecosphere, 3. An anthropocentric worldview that instrumentalizes non-human nature and by denying intrinsic value legitimates wholesale exploitation of the biosphere, 4. The uncontrolled explosion in human population which puts exponentially increasing demands on the planet and 5. The excessive and ever-intensifying consumption habits of individuals who consume far more than they need and far more than the ecosphere can sustain over time.

In light of these causes, the thesis then turned to addressing the second question of finding tangible and effective *solutions* to the enormous environmental challenges we now face. Toward that end, first, we can agree with the ecological modernizationists, who proclaim the urgent necessity of a system-wide overhaul of science, technology and industrial infrastructure. With the ecological modernizationists, we must demand the aggressive replacement of antiquated, polluting and inefficient factories and power plants with newer, cleaner models. More importantly, we must ecologically rationalize our systems of production by replacing dirty energy sources like coal, oil and nuclear with clean alternatives such as solar, tidal, geothermal and wind. In effect, ecological modernization theory advocates erecting a clean energy infrastructure that will free us from our reliance on non-renewable and ecologically devastating sources of energy and make possible a new industrial revolution that is efficient, non-polluting and sustainable.

These environmental gains would be further enhanced by the wide scale adoption of innovative new technologies like hybrid and electric cars that reduce carbon emissions and reliance on oil. Finally, Ecological Modernizationists hold out the promise of radical mega-scientific interventions in the planetary Earth-system that could avert wholesale ecological catastrophe- such as seeding the oceans to promote carbon devouring algae blooms or erecting a planetary sunshade out of particles of dust or millions of tiny refractive mirrors, in the process reflecting solar heat back in to space and stalling the process of global warming.

Ecological Marxists, meanwhile, call for nothing less than "the achievement through revolutionary struggle of a more egalitarian society, such as Eco-communalism" (Foster 2009, 260). For the Eco-Marxists, "a Great Transition… is necessary if Barbarization is to be avoided" (Foster 2009, 261). This Great Transition must take the form of "a global ecological revolution…occurring as part of a larger social-and socialist- revolution" (Foster 2009, 263). This revolution would necessarily draw it major impetus from the struggles of working populations and communities at the bottom of the global capitalism hierarchy" (Foster 2009, 263). Such a revolution "would demand, as Marx insisted, that the associated producers rationally regulate the human metabolic relation with nature… in radically different terms than capitalist society" (Foster 2009, 263).

If ecological modernization advocates upgrades, reforms and improvements, and ecological Marxism demands revolution, we can say that deep ecology calls above all else for preservation. Recognizing the intrinsic value and inalienable worth of all living

creatures, species and ecosystems, deep ecologists desire above all a "hands-off" approach to ecological management, where pristine ecosystems are protected from human intervention and remaining pockets of biodiversity and species habitat are protected in order to preserve the sacred and irreplaceable value of these beings and the wilderness landscapes that they inhabit. Therefore, the creation of a global network of marine and terrestrial wildlife preserves is seen as an essential way to stem the tide of planetary mass extinction and allow endangered species to recover and damaged ecosystems to regenerate.

Recognizing that ecosystems provide essential and largely irreplaceable ecosystem services (such as the purification of water and air and the retention of soils), it is estimated that "environmental goods and services provided by natural biological systems have been valued at …$33 trillion annually" (James et al. 2001, 546). By contrast, "the annual funding requirement… for global biodiversity conservation" is estimated to be "approximately $317 billion annually" (James et al. 2001, 547). This means that "conservation in reserves could be achieved for about 1% and conservation in the wider matrix for about 10%, of the annual value of natural ecosystems" (James et al. 2001, 547). Therefore the "annual premium for global biodiversity conservation is miniscule relative to the value of the assets being insured" (James et al. 2001, 547). From a deep ecological point of view, what is urgently needed is "a small shift in government expenditures toward environmental sustainability" which would "preserve a substantial portion of global biodiversity for current and future generations" (James et al. 2001, 549). Ultimately all that is required "is to take the first step toward reducing environmentally

harmful subsidies while linking this progress to funding global biodiversity conservation" (James et al. 2001, 549). If these measures are enacted, "effective conservation lies well within our means", and this effective conservation will protect and preserve the intrinsic value of the life forms, species and ecosystems that deep ecologists cherish and respect (James et al. 2001, 549).

The points of debate between the three theories are significant, especially in terms of their prescriptions for how to get to an ecological society. Ecological modernizationists are advocating for a green-tech transformation and do not think that we need to waste any time on messing with the definitions of the self (as deep ecologists do) nor do they concern themselves with the relations of production which so preoccupy ecological Marxists. Likewise, Marxists disparage both the narrow focus of ecological modernization theory and the quasi-religious mystification that pervades much of deep ecology, seeing in this only another form of alienation. For their part, deep ecologists argue against the "prometheanism" of Marxism and the narrow valuation of nature within ecological modernization. All of these theories have different perspectives on the existence, effectiveness and viability of an environmental state and transnational environmental governance.

For these reasons, it may be argued that these three theoretical perspectives can not fully be reconciled with one another. Each reaches different conclusions about the causes of and solutions to the environmental crisis. However, the best approach may not be to judge the three and try to determine which is ultimately "best". Instead, the most useful

strategy is one of synthesis, drawing from each perspective what is most essential and welding the three perspectives together in order to create a more complete analytical picture and a more robust strategic toolkit. Although the three theoretical paradigms have their conceptual disputes with one another, they can be fused together into a new perspective that is greater than the sum of its parts.

From ecological modernization we take the recognition that society must transform the ways in which it generates energy, produces goods, and utilizes technology in order to create a cleaner and greener infrastructure. From ecological Marxism we take the conviction that the global ecological crisis demands a social revolution that will put to an end the ecocidal processes of capitalism and bring about an eco-socialist society that redresses injustice and inequality and exists in balance with nature. Finally, from deep ecology we take the commitment to transform the way human beings understand themselves and their relationship with nature, so that our value system and way of thinking is freed from the delusions of anthropocentrism and fixed firmly in a new ecological paradigm that is ecocentric in orientation.

None of the three theoretical perspectives can provide all the answers. But taken together, they provide a robust multi-level analysis of the causes of and solutions to the global ecological crisis. Rather than attempt to determine which is ultimately or most correct, the more fruitful approach is to recognize that all have assembled useful insights and all have contributed to the larger project of saving and restoring the ecosphere. The global ecological crisis is a full spectrum problem that impacts every level and facet of society.

Therefore, what is required is a full spectrum response, that does not rest exclusively on any one strategy or the other, but draws on all of them as resources to be utilized synergistically in the completion of the task at hand- preserving human society and the biosphere from ecocidal destruction.

Another way to resolve the conflict between these three theories is to see them as building on each other in an emergent fashion. Ecological modernization points out the need to improve our industrial processes through increased efficiency, decreased resource inputs and reduced pollution emissions. Neither ecological Marxism nor deep ecology would dispute that this is an important step. However, ecological Marxism demands that in addition to this transformation of industrial processes, a social revolution and the abolition of capitalism is also required. Deep ecology would in turn not dispute this, recognizing that the capitalist economic system is completely at odds with ecocentric values. However, deep ecology argues that more yet is needed. Not only cleaner technology and social revolution, but also a profound internal and cultural transformation is needed- one that abandons anthropocentrism, embraces the new ecological paradigm and recognizes the sacred and intrinsic value of non-human forms of life. It is this most complete synthesis, incorporating the most important elements of all three theories, that will provide the most robust strategies for responding to the global ecological crisis.

Surely theorists will continue to dispute the various aspects of their competing theories and continue to argue about the proper analysis of the global ecological crisis. In the

meanwhile humanity must begin at once the task of transforming its technology, its social relations and its self-conception in ways that will put an end to the collapse of the planetary ecosystem by stabilizing the dual crises of climate change and biodiversity loss.

In addition to these three strategic directions for responding to the global ecological crisis, we must also implement strong measures to control the twin problems of uncontrolled population explosion and profligate, excessive consumption by the wealthy and privileged. The solution to the problem of global overpopulation includes making family planning services widely available so that women, girls and their families can be educated in the safe and effective fertility control alternatives that are available to them. Condoms, birth control pills, morning after pills and safe, legal abortions must be universally provided to anyone who wants them, free of charge. Furthermore, effective old age security must be put in place to reduce the pressure on low income families to have large numbers of children as a form of primitive social security. Finally, women and girls must be provided with high quality, affordable and accessible education, as research has demonstrated that well educated girls have fewer children and wait longer before having their first child, all outcomes that contribute to a voluntary, non-coercive reduction in the rate of population growth.

When it comes to regulating the excessive consumption of the rich and affluent, basic lifestyle changes like discouraging the consumption of environmentally destructive meat products and gas-guzzling personal vehicles may go some way to curbing the excesses of

the materialist profligacy of the privileged consumer. Other, stronger measures might include the imposition of heavy, punitive taxes for gluttonous consumer behaviours, such as a hefty tax on fuel-inefficient luxury vehicles, disposable water bottles and "luxury items" such as mansions, yachts and private jets. These harsh, punitive taxes would on the one hand discourage and stigmatize excessive and unnecessary consumption, and at the same time the tax revenue thereby derived could be reallocated to important ecological remediation initiatives, thus reducing the overall impact of profligate consumption on the ecosphere.

We have now seen how all three of our primary theoretical paradigms propose valid, useful and tangible strategies by which the monumental challenges of global ecosystem collapse can be averted and resolved. I have also postulated what I believe are effective responses to the challenges of uncontrolled human population growth and the profligate hyper-consumption of the rich.

The final component to how we can resolve the global ecological crisis is to be found in four general but essential directions for creating positive environmental outcomes. The first strategy emphasizes the "mobilization of environmental movements, particularly "new" or novel movements that expand on…mainstream environmentalism" (Buttel 2000, 309). The second approach aims at "sustaining or enhancing the environmental regulatory capacity of governments". The third paradigm is based on the belief that "the most efficacious route to environmental protection is through international environmental agreements, international environmental regimes and international intergovernmental

organizations" (Buttel 2000, 309). The fourth and final strategy stresses "reduced consumption on the part of individual consumers" and "the exhortation of individuals to consume less or to buy green products such as organic food or recycled paper" (Buttel 2000, 333).

This thesis has shown that we already have at our disposal a strong battery of answers to the question of how we can stop the trajectory of planetary ecocide and repair the monumental damage that has already been done while creating a transformed new society capable of existing in sustainable harmony with the natural world. This will be achieved through a combination of scientific and technological improvements (particularly the shift to green energy such as solar), a profound social revolution based on the commitment to sustainability, community and equality (Foster 2009), and an aggressive campaign of wilderness preservation aiming to establish a global network of marine and terrestrial wildlife reserves capable of safeguarding biological diversity for future generations. Finally we have noted the importance of voluntary fertility controls to non-coercively reduce the human population explosion and punitive taxes and social stigmatization to deter irresponsible and unnecessary patterns of consumption. Last but not least we have recognized that environmental activism, state environmental regulation, international environmental governance and green consumerism all hold promise for bringing us out of ecological despair and in to a bright new future where not only surviving, but *reversing* the global ecological crisis is within our grasp.

Confronting the magnitude of the global ecological crisis can provoke intense feelings of both anxiety and despair. Therefore, it is important to consider that there are many reasons for optimism and hope for a better ecological future. The truth is that there is much to be enthusiastic about in the struggle against ecological collapse. Part of "the good news is that widespread recognition of these issues and the potent symbolism of species endangerment and extinction have galvanized significant political action and financial investment, including a new suite of professional environmentalists and conservationists who venture to the end of the earth in search of solutions" (Borgerhoff et al. 2005, 27).

Encouragingly, "particular aspects of the problem and the need for individual change have reached the public's attention. Growing numbers of people have changed their personal living habits to reduce their ecological footprints" (Brownlee and Kueneman 2012, 69). Certainly "the growing sophistication of movements against … environmental destruction suggests a widespread desire for change", and it is hoped that this desire for change is only beginning to manifest its true transformative potential (Brownlee and Kueneman 2012, 69).

In addition "growing recognition of the problem (has) resulted in concrete action at the national level" (Stoett 2012, 48). As a result, it has become "popular to designate natural areas as protected", and by the year 2000 "reserves covered 7.9 percent of the earth's land area… with many of the protected areas in the biodiversity-rich tropical zones" (Stoett 2012, 48). Along with this, there have been substantial positive changes in how

humans use and interact with their environment, with a hopeful trend towards less exploitive, more sustainable economic uses of nature. For example, ecotourism has taken off "as a small-scale, viable economic alternative to forestry and fishing" (Stoett 2012, 48). Such developments, although still far from reaching their full potential, signal a profound shift in human thinking- allowing communities to profit from biodiversity without destroying it.

Furthermore, ecological values have become increasingly mainstream, and concern for wildlife and wilderness landscapes has gone from a relative rarity to a pervasive cultural norm. We have seen that "public concern for whales, gorillas, panda bears, and other charismatic species (has) kept the issue of wildlife protection on the national agenda in many countries" and the "environmental movement (is) becoming 'mainstreamed' in policy circles" (Stoett 2012, 48). Along with growing concern for high-profile and widely beloved species, there has been a growing "recognition that economic activities (are) driving species to extinction" (Stoett 2012, 48). This recognition has led to the creation of numerous agreements, conventions, regulations and arrangements intended to ensure "the preservation of animals, birds and fish" (Stoett 2012, 48).

Although these arrangements still need to be expanded and in many cases lack the necessary enforcement capabilities, it is nevertheless true that "these arrangements reflect and generate considerable activity, commitment, and energy" and coupled with environmental organizations "their role in the dispersal of scientific knowledge is quite

beneficial" (Stoett 2012, 50). Today "there are many arrangements related to specific species as well, from whales (the International Whaling Commission) to polar bears (the International Agreement on the Conservation of Polar bears)" (Stoett 2012, 50). Collectively, these trends indicate a profound sea-change in the collective human consciousness of ecological issues. Moreover, they indicate a real commitment on the part of human society to move beyond awareness and in to meaningful action. Far from standing idly by as the Earth is irreversibly impoverished, "countless regional, national, and municipal organizations interact with governments on a daily basis to conserve biodiversity today, (and) environmental impact assessments (EIA) have become a standard prefix to development projects, funding decisions, and even tourism destinations" (Stoett 2012, 50). In short, positive change is afoot- awareness of environmental issues has skyrocketed, and efforts to preserve wildlife and restore the planet have sprung up around the globe.

Past successes such as these make it clear that co-operative action can result in substantial ecological progress. We know that "in the past mankind has been able to reverse human-induced harm to the environment by changing harmful practices. For instance, it has been possible to switch to alternatives in order to arrest the damage to the ozone layer from CFC compounds used in certain household and industrial chemicals" (Heesterman and Heesterman 2013, 17). Therefore, there is no reason to doubt that similar successes can be achieved in other areas, if only the political will and scientific knowledge can be generated to mobilize effective and well-informed ameliorative action.

Strategic Framework

We have seen that the three theoretical paradigms of ecological modernization, ecological Marxism and deep ecology each provide useful perspectives on the essential causes and potential solutions to the global ecological crisis. However, the points of debate between the three theories are significant, especially in terms of their prescriptions for how to get to an ecological society. Ecological modernizationists are advocating for a green-tech transformation and do not think that we need to waste any time on messing with the definitions of the self (as deep ecologists do) nor do they concern themselves with the relations of production which so preoccupy ecological Marxists. Likewise, Marxists disparage both the narrow focus of ecological modernization theory and the quasi-religious mystification that pervades much of deep ecology, seeing in this only another form of alienation. For their part, deep ecologists argue against the "prometheanism" of Marxism and the narrow valuation of nature within ecological modernization. All of these theories have different perspectives on the existence, effectiveness and viability of an environmental state and transnational environmental governance.

For these reasons, it may be argued that these three theoretical perspectives can not fully be reconciled with one another. Each reaches different conclusions about the causes of and solutions to the environmental crisis. However, the best approach may not be to judge the three and try to determine which is ultimately "best". Instead, the most useful strategy is one of synthesis, drawing from each perspective what is most essential and welding the three perspectives together in order to create a more complete analytical picture and a more robust strategic toolkit. Although the three theoretical paradigms have

their conceptual disputes with one another, they can be fused together into a new perspective that is greater than the sum of its parts.

From ecological modernization we take the recognition that society must transform the ways in which it generates energy, produces goods, and utilizes technology in order to create a cleaner and greener infrastructure. From ecological Marxism we take the conviction that the global ecological crisis demands a social revolution that will put to an end the ecocidal processes of capitalism and bring about an eco-socialist society that redresses injustice and inequality and exists in balance with nature. Finally, from deep ecology we take the commitment to transform the way human beings understand themselves and their relationship with nature, so that our value system and way of thinking is freed from the delusions of anthropocentrism and fixed firmly in a new ecological paradigm that is ecocentric in orientation.

None of the three theoretical perspectives can provide all the answers. But taken together, they provide a robust multi-level analysis of the causes of and solutions to the global ecological crisis. Rather than attempt to determine which is ultimately or most correct, the more fruitful approach is to recognize that all have assembled useful insights and all have contributed to the larger project of saving and restoring the ecosphere. The global ecological crisis is a full spectrum problem that impacts every level and facet of society. Therefore, what is required is a full spectrum response, that does not rest exclusively on any one strategy or the other, but draws on all of them as resources to be utilized synergistically in the completion of the task at hand- preserving human society and the

biosphere from ecocidal destruction.

Another way to resolve the conflict between these three theories is to see them as building on each other in an emergent fashion. Ecological modernization points out the need to improve our industrial processes through increased efficiency, decreased resource inputs and reduced pollution emissions. Neither ecological Marxism nor deep ecology would dispute that this is an important step. However, ecological Marxism demands that in addition to this transformation of industrial processes, a social revolution and the abolition of capitalism is also required. Deep ecology would in turn not dispute this, recognizing that the capitalist economic system is completely at odds with ecocentric values. However, deep ecology argues that more yet is needed. Not only cleaner technology and social revolution, but also a profound internal and cultural transformation is needed- one that abandons anthropocentrism, embraces the new ecological paradigm and recognizes the sacred and intrinsic value of non-human forms of life. It is this most complete synthesis, incorporating the most important elements of all three theories, that will provide the most robust strategies for responding to the global ecological crisis.

It is necessary, however, to elaborate on the details of how these three diverging schools of thought can be harmonized in a way that allows the best aspects of each to be incorporated into a novel new synthesis that is more than the sum of its parts. This can be done by dividing the strategic timeline in to three periods or stages. The first stage is the *crisis* stage. In this stage (representing the present day), the planetary ecosphere totters on the very precipice of collapse, and the fate of human civilization hangs in the balance.

During this stage there is an urgent need to rapidly transform the technological and industrial infrastructure of society in ways that render it more environmentally sustainable through a process of ecological rationalization that uses science and technology to dramatically reduce resource inputs and waste. These measures are the very same called for by ecological modernization theorists, and because they are designed to be implemented within the current political and economic system, these reforms can be initiated beginning immediately. These measures will help buy time for humanity to implement the more radical changes that are ultimately needed but are not presently on the mainstream political agenda. During this phase, deep ecological strategies such as conservation biology and ecotage will also be utilized to slow the rate of environmental collapse, and both ecological Marxists and deep ecologists will intensify their efforts to generate and strengthen eco-socialist and ecocentric grassroots movements, while at the same time forming a red-green alliance with one another.

The second phase is the *revolution* stage. At this point the ecological modernization of society has pulled the biosphere back from the brink of ecological collapse, and rates of biodiversity loss and climate change have begun to slow, stabilize and perhaps reverse in some areas as a result of the implementation of advanced new ecologically rational technologies such as solar energy, low emission factories and production facilities, improved recycling systems, carbon capture and storage processes and dramatically improved efficiency in the industrial infrastructure. However, the environmental problems facing the planet remain catastrophic and further ecological gains will require

much more dramatic and revolutionary measures.

During the revolution stage, humanity must begin to attack the causes of its environmentally destructive practices at the root. This will require an end to the intrinsically ecocidal economic system of capitalism. At this point the paradigm of ecological Marxism must come into its own, and the grassroots movement which was built and strengthened during the crisis stage must initiate a social and political revolution that will bring about some form of ecosocialism. This will put an end to the capitalist imperatives of unlimited growth and expansion which drive the voracious engines of economic growth at the expense of the finite ecosystems of the planet. This social and political revolution will be led by the red-green alliance between ecological Marxism and deep ecology. The dawn of ecosocialism will not happen all at once. Instead, incremental progress will be made through a combination of environmental social movements, state level environmental legislation and systems of international environmental governance.

Measures to strengthen conservation and curtail pollution, waste and excessive consumption will be enacted at the national and international levels, and a strong environmental state will emerge alongside a robust global ecological policy framework. A legislative and enforcement system will be created to stop problems such as poaching, unsustainable logging and fishing practices, and runaway carbon emissions that drive climate change. The intervention of state environmental regulation and international environmental governance will first reform and then replace capitalism itself, gradually transforming it in to the new system of ecological socialism, where the free market is

subjugated to the environmental priorities of biosphere stabilization and restoration. The profit motive will be curtailed wherever its excesses lead to environmental harms, and economic activity will be centrally coordinated by an ecologically motivated political control structure in order to ensure the sustainability of human society.

During the revolution stage the radical preservation measures demanded by deep ecology will be implemented, designating vast swathes of wilderness land inviolate and creating a global conservation network of national parks and marine reserves that are protected from industrial incursion. The basic structures of society will be radically changed by the ecosocialist revolution in a way that will improve equality, social justice and harmony between humanity and nature. During this period the technological and scientific reforms of ecological modernization will continue, although now administered under a post-capitalist political and economic system. During this period radical developments in technology such as cold-fusion may be developed, potentially revolutionizing human energy systems and dramatically curtailing the risks associated with anthropogenic climate change. At the same time the deep ecological norms and values of ecocentrism and appreciation for the intrinsic worth of non-human species will become more mainstream in the conducive atmosphere of the ecosocialist environmental state and international environmental governance, which will proactively encourage these values through educational campaigns.

The final stage is the *transformation* stage. In the crisis stage, humanity will pull itself back from the brink of ecocidal self-destruction. In the revolution stage, humanity will

radically change its basic economic, social and political systems in a way that will address the underlying causes of the environmental crisis. During the revolution stage significant environmental gains will be achieved, biodiversity loss and climate change will be stopped in their tracks, and values, norms and priorities will shift in the direction of an ecocentric moral paradigm. In the final stage of *transformation*, the way in which humans understand themselves and their relationship to nature will be profoundly changed. The anthropocentrism that has predominated throughout post-industrial history will be replaced by the ecocentric self-conception promoted by deep ecology, in which the sentiment of "no compromise in defense of mother Earth" and the recognition of the intrinsic value of non-human life becomes commonplace.

During the transformation stage, initiatives will be implemented to actively control population growth and to insure a negative trend in population, with the number of human beings decreasing over time. The human exploitation of nature will be confined exclusively to those areas that are indispensable to meeting human needs. Ecocentric norms and values will lead people to dramatically curtail their consumption, reduce their family sizes, and adopt sustainable lifestyles. Humans will no longer see the planet Earth as a reservoir of resources to be exploited to satisfy human wants, but as sacred mother and home. Killing other species such as dolphins, whales and orangutans will be considered as morally reprehensible as the murder of a human being, and will be subject to equivalent legal penalties and social condemnation.

During the transformation stage humanity will move beyond stopping the ecological

crisis in its tracks and begin the long process of restoring the ecological richness that has been lost since the industrial revolution. Not only will deforestation be reduced to nothing but reforestation will be undertaken, deserts will be reclaimed and made green, captive populations of endangered animals will be reintroduced to the wild, and the populations of species that hover at the brink of extinction will begin to rise towards their former levels. Extreme ecologically destructive behaviors will be considered as morally unconscionable as human slavery, and practices such as bottom trawling, toxic waste dumping, poaching for ivory, abusive factory farming of meat animals and whaling will be relegated to the history books and looked upon with the same shame and disgust as historical atrocities such as slavery and genocide.

Of course, like slavery and genocide, acts of environmental harm and ecocide will certainly continue to occur, but they will no longer be considered acceptable parts of business as usual, and will be subject to the same moral condemnation and legal penalties as the most egregious criminal acts today. The equivalent of human citizenship will be extended to many higher animals, all levels of organic life from the individual plant or animal to the largest ecosystem and the biosphere itself will be extended moral consideration and treated with reverence and respect. It will no longer be considered acceptable to inflict environmental harms simply to satisfy non-essential human desires nor for motives such as profit or economic growth. What is taken from the Earth will be only that which is truly necessary to satisfy vital human needs, and improving ecological technology combined with a declining human population will make the necessary drain on the planet's ecosystems smaller with each passing year.

In the transformation stage, the highest potentials of ecological modernization, ecological Marxism and deep ecology will all reach their fruition. Science and technology will have progressed to the stage of dematerialization that ecological modernizationists predict. Production processes will require virtually no inputs of virgin materials and will produce virtually no waste, running on a closed system in which everything is recycled and products move from cradle to grave with virtually perfect efficiency. Solar, geothermal, tidal and wind power will have all but replaced hydrocarbon energy inputs, and thorium reactors, low energy nuclear reactions or even cold fusion may have replaced conventional nuclear power plants. At the same time capitalism will have disappeared, replaced with the ecologically and socially just system of ecosocialism, and a strong environmental state and a robust system of international environmental governance will have been created with full legislative and enforcement capacities aimed at ensuring an ecologically rational and sustainable human social organization. Finally, the highest moral, spiritual and preservationist ideals of deep ecology will have been realized. Moral and legal consideration will have been extended beyond the boundaries of the human species and rights and freedoms will have been bestowed on individual plants and animals as well as entire species and ecosystems.

Humans will no longer see themselves as masters of the planet, nor will they view non-human species as resources to be consumed and exploited for pleasure or profit. Instead they will see themselves as one part of an interdependent web of life. They will be ecocentric in moral and philosophical orientation, and the concept of ecological rights

will be as widely accepted and enforced as the concept of civil and human rights are today. Earth will be seen as sacred home and mother, other lifeforms will be viewed as familial relations and ecosystems will be venerated and inviolable preserves of intrinsically valuable organisms. The global ecological crisis will have been averted, and the process of restoring the planet's damaged ecosphere will begin.

The above timeline may seem optimistic, unrealistic and utopian. There is certainly no guarantee that any of these achievements will come to pass. The alternative may be far more likely. Humanity may continue along its ecocidal course until the majority of species are extinct, the planet's life sustaining ecological functions collapse and human civilization is decimated. Humanity itself may well follow the rest of life on Earth into absolute extinction, eradicated by their own excesses. Or perhaps we shall achieve the first of these stages and pull ourselves back from the precipice of ecological collapse but never achieve the higher stages of revolution or transformation, managing only to render business as usual slightly less suicidal but never reforming the exploitative economic system of capitalism or the anthropogenic world view that sees other lifeforms as nothing more than commodities to be converted into profit.

The timeline laid out here is not intended to be a prophecy. It is intended to be a speculative conceptual roadmap that envisions how the three major theoretical paradigms of ecological modernization, ecological Marxism and deep ecology could collectively contribute to building a positive environmental future in a partly synergistic, partly sequential manner. It delineates how each of these paradigms could contribute to

responding to the global ecological crisis in a non-exclusive manner, providing some but not all the pieces of a larger environmental puzzle. It envisions how ecological modernization reforms during the crisis stage could lead to more radical eco-Marxist measures in the revolution stage and finally culminate in the complete deep ecological reorientation of human civilization in the transformation stage.

As unrealistic as this scenario may seem, it is important to remember that every aspect of the contemporary life we take for granted would have been seen as wildly improbable in the past. Only a few hundred years ago it would have been utterly unimaginable that thousands of flying machines would traverse the world daily. None would have predicted that the entire planet would be joined together by a vast system of instantaneous data transfer known as the internet, nor that manned missions to mars would be on the immediate technological horizon. A few generations ago it would have been inconceivable to many that women would have the right to vote, homosexuals would have the right to marry, slavery would have been abolished and a dark skinned man would be president of the United States. Social and technological progress often seem implausible until they happen, and the history of humanity is one of radical and unforeseen developments both good and ill.

There is no reason to believe that the transformation of human civilization and the restoration of the planetary biosphere are impossible, and every reason to work towards those goals with all the conceptual and pragmatic tools at our disposal. The above timeline is an attempt to develop a framework for how that project could actually proceed

through the implementations of the strategic recommendations of the three theoretical paradigms of ecological modernization, ecological Marxism and deep ecology. From crisis to revolution to transformation- from reform to radical change to a completely new stage of human civilization. This is the future we should envision and struggle to manifest. We have to believe that an environmentally sustainable humanity is at least as possible as the ecocidal self-destruction of our species. Neither outcome is inevitable, but it is clear to which of the two we should aspire.

The framework outlined here provides an initial idea of how we can begin the project of relegating "the global ecological crisis" to the history books, so that ecocidal self-destruction can be averted in the same way nuclear holocaust was averted during the height of the cold war. Then, as now, we were at a historical turning point when the complete obliteration of human society seemed imminent. Now, as then, we must prove the doomsayers wrong, and show that our species is capable of solving the environmental problems it has created before the age of humanity vanishes into the past. We must avert an apocalypse of our own creation, and we who have been the scourge of the biosphere must become its saviors. Succeed or fail, it is future generations who will suffer the consequences, or reap the benefits, of the choices we make today.

Conclusion:

So we close where we began- with the question at the heart of it all: "Can we save this wonderful, green and blue, mountain high and ocean deep planet from further human abuse? Can we overcome the political divisions (and attendant conflict) that have so far limited the probability of an effective, collective response? ...Can we turn the decline around, despite ourselves?" (Stoett 2012, 1-5). As we have seen, there are numerous practical, effective strategies for meeting the environmental crisis head on and achieving a future where future human generations can enjoy a healthy, abundant, sustainable ecosphere. Therefore, I answer these deep questions, in the same way that Peter Stoett has done in his recent book on *Global Ecopolitics*, with a simple but hopeful answer- "I think we can; I think we will. But I also think we need to dedicate ourselves to living collective lives in which this project is central, indeed, fundamental to our plans and purposes; and international environmental (efforts) must be stepped up several notches to reflect the magnitude of the challenges". Ultimately, "anyone who has enjoyed a brilliant sunset, heard birds greet morning sun, or smiled back at a child's happy eyes knows it is worth trying" (Stoett 2012, 5).

Works Cited

Altheide, David L. "Tracking discourse and qualitative document analysis." *Poetics* 27.4 (2000): 287-299.

Barnes, P. (2006). *Capitalism 3.0: A guide to reclaiming the commons*. San Francisco, CA: Berrett-Koehler.

Bauman, Zygmunt. *The Individualized Society*. Cambridge: Polity, 2001.

Benton, Ted, ed. *The greening of Marxism*. Guilford Press, 1996.

Berry, Thomas. "Ethics and ecology." *Harvard Seminar on Environmental Values, Harvard University*. Vol. 9. 1996.

Brownlee, Jamie, and Rodney Kueneman. "Transitioning From Endgame to Sustainability Revisiting the Commons Trusts Model." *Organization & Environment* 25.1 (2012): 59-75.

Buttel, Frederick H. "New directions in environmental sociology." *Annual review of sociology* (1987): 465-488.

Buttel, Frederick. "Ecological Modernization as Social Theory." *Geoforum* 31 (2000) 57-65.

Canan, Penelope. "Bringing nature back in: The challenge of environmental sociology." *Sociological inquiry* 66.1 (1996): 29-37.

Cassel-Gintz, M., and G. Petschel-Held. "GIS-based assessment of the threat to world forests by patterns of non-sustainable civilisation nature interaction." *Journal of Environmental Management* 59.4 (2000): 279-298.

Clarke, Tony. *Tar Sands Showdown: Canada and the New Politics of Oil in an Age of Climate Change*. Toronto: Lorimer and Company, 2008.

Clausen, Rebecca, and Brett Clark. "The Metabolic Rift and Marine Ecology An Analysis of the Ocean Crisis Within Capitalist Production." *Organization & Environment* 18.4 (2005): 422-444.

“Deforestation in Decline but Rates Remain Alarming, UN Agency Says” UN News Centre. May 23 2013. (http://www.un.org/apps/news/story.asp?NewsID=34195#.UZ61G_drZMs)

Devall, Bill. "The Deep, Long-Range Ecology Movement: 1960-2000--A Review."

Ethics & the Environment 6.1 (2001): 18-41.

Devall, Bill, and George Sessions. "Deep ecology." *Technology and Values: Essential Readings* (1985): 454-59.

Devall, Bill. "The end of American environmentalism?." *Nature and Culture* 1.2 (2006): 157-180.

Diamond, Jared. *Collapse: How Societies Choose to Succeed or Fail.* New York: Viking, 2005.

Dickens, Peter. "A green Marxism? Labor processes, alienation, and the division of labor." *Sociological Theory and the Environment: Classical Foundations. Contemporary Insights. RE Dunlap, FH Buttel, P. Dickens and A. Gijswijt. Lanham, MD, Rowman, Littlefield Publishers, Inc* (2002): 51-72.

Dunlap, Riley E. *Sociological Theory and the Environment: Classical Foundations, Contemporary Insights*. Rowman & Littlefield, 2002.

Ehrlich, Paul R. "The population bomb." New York: Ballantine (1968): 1-32.

Eliasch, Johan. *Climate change: Financing global forests: the Eliasch review*. Routledge, 2008.

"Facts and Statistics". *Alberta Energy.* 18 May 2013. (http://www.energy.alberta.ca/oilsands/791.asp)

Fisher, Dana R., and William R. Freudenburg. "Ecological modernization and its critics: Assessing the past and looking toward the future." *Society & Natural Resources* 14.8 (2001): 701-709.

Foreman, Dave. "Putting the earth first." *Debating the Earth: The environmental politics reader* (1998): 358-364.

Foster, John Bellamy. "Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology." American Journal of Sociology *105.2 (1999).*

Heesterman, A. R. G., and W. H. Heesterman. *Rediscovering Sustainability: Economics of the Finite Earth*. Gower Publishing Company, Limited, 2013.

Homer-Dixon, Thomas. *How Peak Oil and the Climate Crisis Will Change Canada (And Our Lives).* Toronto: Vintage Canada, 2010.

Huber, Joseph. "Towards industrial ecology: sustainable development as a concept of ecological modernization." *Journal of Environmental Policy and Planning* 2.4 (2000): 269-285.

Humphrey, Craig, Tammy Lewis and Buttel, Frederick. *Environment, Energy and Society: Exemplary Works.* Michigan: Wadsworth Publishing, 2002.

James, Alexander, Kevin J. Gaston, and Andrew Balmford. "Can we afford to conserve biodiversity?." *BioScience* 51.1 (2001): 43-52.

Korten, David. *The Great Turning: From Empire to Earth Community.* San Francisco: Kumarian Press, 2006.

Laurance, William F. "Reflections on the tropical deforestation crisis." *Biological Conservation* 91.2 (1999): 109-117.

Lloyd, Jason. "Toxic Trade: International Knowledge Networks and the Development of the Basel Convention." *International Public Policy Review* 3.2 (2008).

Mares, Dennis. "Criminalizing Ecological Harm: Crimes Against Carrying Capacity and the Criminalization of Eco-Sinners." *Critical Criminology* 18.4 (2010): 279-293.

Marsden, William. *Stupid to the Last Drop: How Alberta is Bringing Environmental Armageddon to Canada (And Doesn't Seem to Care).* Toronto: Vintage, 2007.

Mattei, Ugo, and Laura Nader. *Plunder: when the rule of law is illegal*. Wiley-Blackwell, 2008.

McLaughlin, Andrew. *Regarding nature: Industrialism and deep ecology*. Suny Press, 1993.

Meadows, Donella H., et al. *The Limit s to Growth-A Report to The Club of Rome (1972)*. Vol. 22.

Mol, Arthur PJ, and Gert Spaargaren. "Ecological modernisation theory in debate: a review." *Environmental politics* 9.1 (2000): 17-49.

Mulder, Monique Borgerhoff, and Peter Coppolillo. *Conservation*. Princeton University Press, 2005.

Narby, Jeremy. *The Cosmic Serpent: DNA and the Origins of Knowledge*. New York: Putnam, 1998.

Naess, Arne. "A defence of the deep ecology movement." *Environmental Ethics* 6.3 (2008): 265-270.

Naess, Arne. *Ecology, community and lifestyle: outline of an ecosophy*. Cambridge University Press, 1990.

Naess, Arne. "The deep ecological movement: Some philosophical aspects." *Philosophical Inquiry* 8.1-2 (1986): 10-31.

Naess, Arne. "The shallow and the deep, long-range ecology movement. A summary∗." *Inquiry* 16.1-4 (1973): 95-100.

Nikiforuk, Andrew. *Tar Sands: Dirty Oil And The Future Of A Continent* . Vancouver: Greystone Books, 2008.

Nikiforuk, Andrew. "What Those Who Killed the Tar Sands Report Don't Want You to Know." *The Tyee* (2010).

O'Connor, James R. *Natural Causes: Essays in Ecological Marxim*. The Guilford Press, 1998.

"Oil Sands". *Alberta Energy*. 18 May 2013. (http://www.energy.gov.ab.ca/ourbusiness/oilsands.asp)

Pagiola, Stefano. "Payments for environmental services in Costa Rica." *Ecological economics* 65.4 (2008): 712-724

Redclift, Michael and Woodgate, Graham. "From a Sociology of Nature to Environmental Sociology: Beyond Social Construction." *Environmental Values* 7.1, (1998) 3-24.

Reid, Walter V., et al. "Biodiversity prospecting." *Medicinal Resources of the Tropical Forest: Biodiversity and Its Importance to Human Health. Columbia Univ. Press, New York* (1996): 142-173.

Sachs, Jeffrey. *Common Wealth: Economics for a Crowded Planet*. New York: Penguin Press, 2008.

Scheinberg, Anne. "The proof of the pudding: urban recycling in North America as a process of ecological modernisation." *Environmental Politics* 12.4 (2003): 49-75.

Sherrington, Mark. "Biodiversity assessment in the oil sands region, northeastern Alberta, Canada." *Impact Assessment and Project Appraisal* 23.1 (2005): 73-81.

Smandych, Russell, and Rodney Kueneman. "The Canadian-Alberta tar sands: a case study of state-corporate environmental crime." *Global Environmental Harm: Criminological Perspectives* (2013): 87.

Snyder, Gary. *The practice of the wild*. Counterpoint Press, 2010.

Solinge, Tim. "Deforestation Crimes and Conflicts in the Amazon." *Critical Criminology*

18.4 (2010).

Sonnenfeld, David A. " Developing countries: Contradictions of ecological modernisation: Pulp and paper manufacturing in South-east Asia." Environmental Politics 9.1 (2000): 235-236.

Sonnenfeld, David A. "Social movements and ecological modernization: the transformation of pulp and paper manufacturing." *Development and Change* 33.1 (2002): 1-27.

Mol, Arthur PJ. "Ecological modernization and the global economy." *Global Environmental Politics* 2.2 (2002): 92-115.

Stern, David I. "The rise and fall of the environmental Kuznets curve." *World development* 32.8 (2004): 1419-1439.

Stoett, Peter J. *Global Ecopolitics: Crisis, Governance, and Justice*. University of Toronto Press, 2012.

Taylor, Bron. "Earth and Nature based spirituality (part 1): from deep ecology to radical environmentalism." Religion 31.2 (2001): 175-193.

Taylor, Bron. "The religion and politics of Earth First!." *The Ecologist* 21.6 (1991): 258-66.

Van Solinge, Tim Boekhout. *Eco-crime: the tropical timber trade*. Springer New York, 2008.

Ward, Peter D. *Under a green sky: global warming, the mass extinctions of the past, and what they can tell us about our future*. Smithsonian, 2007.

White, Rob. *Global Environmental Harm: Criminological Perspectives.* Oregon: Willan Publishing, 2010.

White, Rob. *Transnational Environmental Crime: Toward an Eco-global Criminology.* New York: Rutledge, 2011

Zhao, Shanyang. "Metatheory, Metamethod, Meta-Data-Analysis: What, Why, and How?" *Sociological Perspectives* 34.3. (1991) 377-390.

Zia, Asim. *Post-Kyoto Climate Governance: Confronting the Politics of Scale, Ideology and Knowledge*. Vol. 27. Routledge, 2013.