A Culture of Environmentalism:
An Ethics-based Response to the Environmental Crisis and its Implications for Architecture

by

Christian Alexander Lukachko

A thesis

presented to the University of Waterloo

in fulfilment of the

thesis requirement for the degree of

Master of Architecture

in

Architecture

Waterloo, Ontario, Canada, 2004

Author's Declaration

I hereby declare that I am the sole author of this thesis.

I authorize the University of Waterloo to lend this thesis to other institutions or individuals for the purpose of scholarly research.

Signature

I further authorize the University of Waterloo to reproduce this thesis by photocopying or by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

Signature

Abstract

A Culture of Environmentalism:
The Effective Solution to the Environmental Crisis and its Implications for Architecture

In response to the confusion surrounding the activity of sustainable design and sustainability theory in general, this thesis proposes a culture of environmentalism as a clear and effective solution to the environmental crisis and a central role for architecture. A review of the history of the modern environmentalist movement is given as background for our understanding of the environmental crisis. Various theories outlining practical solutions based on economics and technology are critiqued before centring attention on an environmentalist ethic as an effective solution to what is a cultural problem. The conditions for a culture of environmentalism necessary to implement this ethic are examined. As an epilogue, architecture is put at the forefront of this change on the grounds that it is central to our awareness of the world that we live in and can provide a positive image of a sustainable society.

Acknowledgements

I would like to acknowledge the guidance and criticism of my thesis supervisor, Dr. John Straube, and the assistance of my Advisory Committee members professors John McMinn and Eric Haldenby. I thank also professor Robert Wiljer for his counsel earlier in the process, and Charles Simon for his perspective on my work at the end.

For their unwavering support and encouragement, I deeply thank my parents, Wendi and Gary, and my wife, Deborah.

The study for this thesis was completed, in part, under an Ontario Graduate Scholarship from the Government of the Province of Ontario.

Dedication

for Stephanie Lukachko

Table of Contents

List of Illustrations

Introduction

About Sustainable Design

In contemporary architecture there is growing interest in a set of technical, ideological and social concerns that are together called sustainable design.[1] Sustainable design is changing the way that architecture is practised. The extent of these changes -whether they are a fundamentally different way of looking at the task of building or, at a minimum, a trend of temporary interest to architects - remains unclear. The argument behind sustainable design rests with the widely accepted belief that there is a crisis in our environment that is caused by human activity. This crisis, it is claimed, presents such a serious threat to our welfare that without immediate action, our global community may be unable to avoid catastrophic consequences for humanity and the natural world that we live in. Sustainable design, therefore, is presented as a great challenge to architects and other designers to work towards changing society to resolve the environmental crisis.

There have been a wide variety of responses to the challenge, each professing its ability to resolve environmental problems, but no consistent theoretical background has been established. Two examples of attempts to resolve the environmental crisis through building are *high-tech green design*[2] and *eco-building design*.[3] The high-tech approach sees the environmental impact of buildings as a technical problem and responds with technological solutions. Key issues such as poor energy efficiency and over-use of resources are dealt with by advanced building systems such as double-facade curtain walls and carbon dioxide sensor controlled ventilation systems. Eco-building, on the other hand, sees the environmental impact of buildings as a social problem and reaches outside of our technology-rich culture for solutions. Eco-buildings more often rely on traditional, local methods and technology because they are perceived to have a low impact on their native environs. A balanced relationship with the surrounding ecosystem and concern for future generations are primary issues.

---

[1]The terms environmental design, ecological design, and green design are also commonly used. Each would seem to have a different meaning but they are all applied inconsistently to refer to what, in this thesis, is called sustainable design.

[2]In Canada, the buildings by Busby and Associates in Vancouver are a good example of the high-tech approach to sustainable design. The York University Computer Science Building (Toronto, 2001) and the Telus Office Building (Vancouver, 2000) are good examples of this work. (www.busby.ca/projects.htm)

[3]Strawbale buildings, “Earth-ships,” and other alternative technologies are often associated with eco-building. Generally, these projects have other, special conditions that don’t make them fit well with normal building practice. Although often done as demonstrations, most projects have a social commentary component that is easily recognisable.

Although both of these examples follow from the same basic understanding of the need for sustainable design, each shows a different understanding of what the environmental crisis is and therefore, what the appropriate solution should be. The conceptual disagreement reveals itself in the prioritising of environmental issues and in decidedly different, if not contradictory, approaches to the task of building.

High-tech green design can be criticised by eco-builders for generating solutions that only minimise the environmental impact of our society in the short-term without making fundamental changes to prevent long-term destruction. High-tech double-facade walls, for example, are a technologically sophisticated response to the problem of high heating and cooling loads in office buildings. Whatever the success of this technology in achieving a reduction in energy use, an eco-builder might reasonably point out that the double facade only slightly lessens our overall energy use without altering our society's dependancy on existing non-renewable energy sources, and actually does all of this with the added cost of an increase in the intensity of material resource use. Such technological responses are seen to be perpetuating the problem while giving society the mistaken impression that a solution has been found.

Eco-buildings, in turn, might be called unrealistic and shortsighted because of the low density that they often encourage. An off-grid strawbale house designed to be built and occupied by a single family is an excellent example of local sustainability but could misleadingly exemplify a lifestyle that will be inaccessible to, or undesirable for, the vast majority of the world's now urban population. While such a project works to reduce energy use, resource use, and perhaps pollution, it does not convincingly address the global land-use crisis and the related problem of density with the success of the high-tech, technology-intense urban structure discussed above.

Such fundamental disagreement has lead to uncertainty about the reasons for and the effects of sustainable design. To address the uncertain benefits of sustainable buildings, building performance rating systems such as ATHENA[4], LEED[5] and BREEAM[6] have been introduced. The systems are based, in part, on a scientific understanding of the impact that buildings have on the environment and the economy. Various imperatives such as the need for greater energy efficiency and resource conservation have been translated into standards for sustainable building that are widely accepted regardless of whether or not there is agreement about the appropriateness of the solutions that they recommend. Critics point out that because of this approach, "the debate around green building revolves around differently configured technical structures that can be judged through the exchange and comparison of objective findings" leaving out, as it were, discussion of the principles that underlie the systems themselves.[7]

Pushing the disagreement about fundamental principles to the background has

---

[4]The *Athena* program is an environmental impact estimator and life cycle costing tool developed in Canada by the Athena Sustainable Materials Institute (http://www.athenasmi.ca).

[5]*Leadership in Energy and Environmental Design* is a popular North American program established by the U.S. Green Building Council (http://www.usgbc.org/LEED/LEED_main.asp).

[6]The Building Research Establishment's *Environmental Assessment Method* is widely used in the UK (http://products.bre.co.uk/breeam/).

[7] Guy, Simon and Graham Farmer. "Contested Constructions" in Fox, Warwick. (ed.) *Ethics and the Built Environment* New York: Routledge, 2000. Page 74.

opened up opportunities for further complication of the issue. In addition to officially classified sustainable building, the term 'green-washing' has entered popular use to describe building designs that profess some commitment to sustainable principles but do not fall in with the consensus represented by the scientifically-based rating systems. The motivations behind green-washed buildings may be economic or ideological.

Financially, the cost of designing a full officially-rated sustainable building is often claimed to be prohibitive,[8] but an additional profit on the building might be derived through the construction of easily identifiable 'features' such as photovoltaic panels or a green roof that would appeal to the public's increased interest in sustainablity. Having the environmentalist agenda even inadvertently co-opted by economic interests without concern for the fundamental social change sustainable design promotes adds a powerful distortion into the process.

Differences in design philosophy may lead to a partial acceptance and use of commonly encouraged sustainable building techniques and a rejection of them where other design considerations are deemed to have higher priority. The emphasis on energy efficiency in the LEED program, for example, supports design strategies that minimise the exterior surface area of the building enclosure; that position the building advantageously with respect to solar orientation; and that rely sparingly on energy consumptive systems and devices. A designer may disagree with the siting and massing of a building that these techniques suggest but may still make a great effort to create a healthy indoor environment to address another design objective perceived to be linked to the sustainability agenda. A designer may hold that the commonly accepted idea of sustainable design does not adequately credit the importance of other, non-technical aspects of a good architectural design. Buildings may therefore reflect design decisions that are only partially consistent with the sustainability agenda.

All of these factors hinder architects' ability to judge the appropriateness of sustainable design efforts. What is missing is a clear understanding of what the crisis is and how we can respond to it in a way that can show measurable effectiveness. The incomplete conceptual framework that backs sustainable design makes these kinds of decisions difficult and current well-intentioned efforts risk becoming meaningless or, even worse, causing further environmental decline. This thesis addresses the lack of certainty in the conceptual framework for sustainability in general and sustainable design in particular. Within this thesis two claims are made: one about the understanding of the environmental crisis, and one specifically about the role of architecture.

The former claim, which constitutes the main body of the thesis, argues first that the environmental crisis has been caused by flaws in our worldview - not by an improper allocation of mental or material resources as is commonly thought; and second, that despite the current focus on technology and the economy, the present crisis will not be solved by technological, economic or political means, but instead by a change in awareness of our position in the world and an accompanying ethic that can reflect more accurately the reality of our situation. The latter claim, which is developed as an epilogue to the argument above,

---

[8]The governments have attempted to address this fact by offering incentive programs to compensate the building owner. The Canadian federal government's Commercial Building Incentive Program, for example, provides a cash reward for the building owner based the actual increased energy efficiency of the new building with the expressed intent that the money be used to offset the additional design time required to achieve the performance increase. (http://oee.nrcan.gc.ca/newbuildings/cbip.cfm)

is that architecture, as an art form central to our awareness of the world around us, and because of its role as a central offender in the ongoing destruction of the environment, places architects at the forefront of this cultural change.

The Parts of the Thesis

The first claim is developed in three parts. In part one, *Our Understanding of the Environmental Crisis*, a historical and philosophical context is developed for the nexus of issues that we refer to as the environmental crisis. To provide this context, a history of the environmentalist movement is given. The selected events and works presented in this history were chosen because of their major contributions to the way that we understand the environmental crisis and the solutions that we favour for dealing with it. Sustainable development is introduced as the proposed framework for international effort to resolve the crisis. The limitations of this framework are discussed and a critical view is established of the sustainable agenda.

In the second part, *Towards a Clearer Understanding*, a series of approaches to solving the environmental crisis are tested. The examples, which start with proposals most directly related to the framework discussed in Part 1, are arranged in a sequence that highlights each proposal's critique of the effectiveness of the previous one. There is no historical timeline followed here because our society has pursued different solutions inconsistently, sometimes returning to one that has fallen out of favour as our understanding of the crisis changes. Each successive theory discussed takes us away from a naive concern with superficial change we seem to favour to a less comfortable questioning of our basic values and beliefs. The complexity of nature is identified as a major challenge to understanding the consequences of our actions and, therefore, to effectively guiding social change.

In the final part, *Foundations for a Lasting Solution*, an environmentalist ethic based on ecological principles is proposed as a solution that effectively addresses the complexity of the environmental crisis and the need to quickly develop solutions. The ecological basis for an ethic is identified and the need for a cultural context to make the ethic understandable is explored.

The second claim made by the thesis is presented as an epilogue to the argument introduced above. In the epilogue, A Statement of Architecture’s Role in the Environmentalist Movement, the implications of the thesis for the practice of architecture are explored. Starting with the impact of building on the environmental crisis, architecture is shown to have the potential to make a major contribution to solving the problem. Architects are in a position to affect the massive flow of energy and materials that are marshalled into a building project. Architects are therefore in a leadership role in the task of transmitting an appropriate environmentalist ethic to a wide number of people. The ethical implications of both being in this position and having been given by society responsibility for creating a healthy environment for human life are examined.

Beyond these practical ends, opportunity is seen to strengthen the understanding of architecture as a meaningful act in the environment. Christian Norberg-Schulz's understanding of architecture as a fundamental part of humanity's conceptual framework and connection to place is presented as a foundation for the view that architecture can play an enlarged role in the resolution of the environmental crisis. The creation of a meaningful relationship with the environment goes beyond the knowledge that architecture can make a

positive contribution by lessening the environmental damage, as outlined in the beginning of the epilogue. This discussion comes, perhaps, the closest to understanding how architecture can express a concrete image of what a truly sustainable society might be like. In this there is seen also the possibility for the profession to recover its sense of social utility in the eyes of the society it serves.

Environmentalist Rhetoric

Writing about the environmental crisis is often filled with statistical examples of the impact of our society on the natural world. This thesis will not depend on numerical examples because of several important problems with this method of argumentation. Take for example, a global concern such as the potential for over-use of drinking-quality water. The numbers used to describe this aspect of the environmental crisis range in scale from the individual's daily use of water, to the water use of an entire city or region, to the global figures on water consumption and availability. Each of these scales - individual, community, global - requires a frame of reference to make the numbers understandable and only one of them - the individual scale - can rely on typical human experience to provide this frame of reference.[9]

The relative complexity of the statistical information presented adds another barrier to the ability of readers to properly comprehend the information being given. Properly used, statistical information can provide us with an indicator of some more complex process that cannot be simply represented. The complexities are such that it is doubtful that any particular indicator can be read clearly by the general public without first acquiring some level of understanding of the larger system that the information is taken from. This is a strenuous requirement to satisfy for environmentalist literature because the crisis is explicitly related to the complexity of our society and the complexity of the world around us.

The problem with the use of numeric information to describe problems in the environment is that regardless of actual comprehension, the reader is almost invariably affected by a separate sense of the magnitude of the number. Having no way of comparing large numbers to personal experience, the importance of the information may be largely

---

[9]Just as an example of statistics at these different scales, residents in the City of Waterloo used 0.215 cubic metres of water per day per person in 1999 - in more understandable units this is 215 litres of water per day for each resident; for the City of Waterloo, the total water consumption for residential use is 16781 cubic metres per day, or 16 781 000 L/day; and Canada's residential water use in the same year was 10 464 689 900 litres of water per day (343 L/per/day for 30.5093 million people. Reference for all numbers are 1999 statistics from: www.ec.gc.ca/water/en/manage/use/e_use.htm: 1999).

The amount of water used per person per day may be understandable in terms of direct experience. The litre is a common enough measurement but at hundreds of litres familiar references become stretched: a low-flush toilet uses 6 L per flush, a five-minute shower might use 45 L of water, a single bath uses 150 L, watering lawns and gardens may be 950 L/hour (Ref: City of Calgary Water Audit Worksheet, www.calgary.ca). International comparisons must also include an understanding of cultural habits to make a direct comparison fully understandable and therefore usefully motivating: France, for example uses 150 litres of water per person (which, incidentally, with a population of less than 60 million in 1999, France about 15% less water for domestic uses than Canada's population as a whole. Same reference) and the United States uses 382 L of water per person but the way that water is used may vary greatly.

missed. Since astounding the reader may well be the rhetorical strategy of the writer, proper context may not be provided and the reader may unfairly be left in a helpless position. The point of most environmental writing, it should be noted, is to communicate information with the intention of building understanding and the choice of rhetorical tactic designed to overwhelm the reader defeats the possibility of a real understanding of the problem.

Statistician Bjørn Lomborg has made a now infamous attack on the systematic misuse of statistical information in both activist and scientific literature about the environmental crisis. His point generally is that environmentalists, whether knowingly or not, make a habit of exaggerating the negative impact of the information that they provide. He claims that an Environmentalist Litany is created by the repetition of the same frequently abused numerical examples in part of a rhetorically forceful but factually deficient argument about the poor state of the world.

Referring to the well-known and influential *State of the World* publication from the Worldwatch Institute, Lomborg notes that a year 2000 review of the previous 16 years of annual reporting claimed that few of the most pressing environmental problem from the original report had been solved. After reviewing relevant statistical indicators, he concludes that of the list of environmental problems, which had included population growth, the price of oil, international debt, and forest damage due to acid rain, "all have of which have improved since then, and all but one of which have improved immensely, and one of which is just plain wrong."[10] The result of such inaccurate reporting, Lomborg claims, is that it is now quite commonplace to acknowledge an impending ecological and social catastrophe as the basic state of the world. The effect the uncritical acceptance of environmentalist arguments is that scientists and policy-makers have ceased to argue about information that really should be subject to the same rigorous criticism that is applied to all other areas of scientific research:

> The constant repetition of the Litany and the often heard environmental exaggerations has serious consequences. It makes us scared and it makes us more likely to spend our resources and attention solving phantom problems while ignoring real and pressing (possibly non-environmental) issues.[11]

As a whole, Lomborg's attempt to debunk what he refers to as the environmentalist myths, has been rejected by the scientific community on the grounds that he has distorted the hard scientific facts that his argument is based on by not taking into account the complex interactions that the statistical indicators represent. In doing so, he has invalidated his work by overstepping his scholarly authority.[12] Although Lomborg maintains that his arguments do not remove the need for restorative action, he asks that we "focus our attention on the most important problems and only to the extent warranted by the facts."[13] By dismissing

---

[10]Lomborg, Bjørn. *The Skeptical Environmentalist: Measuring the Real State of the World*. New York: Cambridge University Press, 2001. Page 14.

[11]Ibid., page 5.

[12]Pianin, Eric. "Danish Professor Denounced for 'Scientific Dishonesty' Panel of Scientists Assails Scholarship of Book Praised in Press -- 'The Skeptical Environmentalist'" *Washington Post*. January 8, 2003; Page A20. (http://www.washingtonpost.com/wp-dyn/articles/A24584-2003Jan 7.html)

[13]Lomborg, op. cit., page 5.

environmentalist concerns in this way he comes into conflict with one of the most basic tenets of sustainable theory: that lack of scientific evidence is not a reason against preventative action if the possible consequences for our lives and life in general are great.[14]

Lomborg's criticism of the use of statistical information, however, should be heeded. If research and study of the environmental crisis is to be effectively communicated to all parts of society (for this is a problem that affects everyone), then understanding must be built up from a foundation of direct experience. Since there is still much that is unknown about both the environmental crisis and the effects of our actions, our working knowledge about the environment and the proposed solutions must be understood to be provisionary. Dogmatic tendencies in environmentalist thinking therefore need to be avoided. If there is some truth to the claims that Lomborg makes then the environmentalist 'Litany' works against the development of a critical framework. It will be, in part, the contention of this thesis that the resolution to the environmental crisis, will come from people who are willing to think about the solutions on their own, not from people who have been told what the solutions are.

[14]This is called the *precautionary principle*: "Environmental measures must anticipate, prevent and attack the causes of environmental degradation. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation." - International Chamber of Commerce (ICC), *WICEM II: Conference Report and Background Papers* (Paris:1991) quoted in Stephan Schmidheiny, *Changing Course: A Global Business Perspective on Development and the Environment.* Cambridge: The MIT Press, 1992. Page 3.

1: Our Understanding of the Environmental Crisis

Section Summary

The introductory section of this thesis is about environmentalism. There are two objectives to this section. The first is to understand the complicated discourse that has shaped our thinking about the environmental crisis. The second is to make an informed analysis sustainable development, the proposed global solution to the crisis.

The environmentalist discourse is examined beginning with its roots in cultural history and specifically through the direct influences of the Romantic Naturalist and Conservationist movements. The transformation from these pre-environmentalist roots to a distinct way of understanding the crisis in the environment is traced through a selected series of events. Beginning with Rachel Carson's popularisation of ecology, the selected history notes other influences including: dire predictions from Limits to Growth and an awareness of a growing number of interconnected global problems through a series of international conferences concluding with the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, Brazil.

A critical review of the proposed solution follows. The sustainable development concept's entrance into the environmentalist discourse is described from the use of the term in the Brundtland Report to the creation of its guide book *Agenda 21* for the Rio Conference. The idea that sustainable development has been the product of a global consensus on environmental issues is criticised on the grounds that the apparent agreement secured to put forward a global position masks a great degree of uncertainty about both the goals of global action and the form of action required. The conclusion to the section remarks that, although *Agenda 21* is well intended, the fundamental uncertainty surrounding sustainable development leads to acceptance of certain forms of social activity that may in fact interfere with achieving a lasting effective solution to the environmental crisis.

Our Understanding of the Environmental Crisis

Introduction

Environmentalists, at this time, have very little doubt that our global society is operating in a way that if continued unchecked will seriously and perhaps catastrophically alter the biological systems that support life on this planet. Our modern industrial society is often pointed to as the main culprit and with due cause: the industrialised countries in the world operate aggressively towards their own living space and have, through the course of their development, exploited the natural resources of many other countries in the world, often at great cost to the local ecosystems and societies. The lifestyle that is supported by our industry consumes resources at a much higher rate than that available to inhabitants of less technologically sophisticated societies. Consumption is so much higher, in fact, that the same level of welfare, if taken at the same cost to the environment, would simply not be available to the significantly higher number of people in developing countries. Many of these countries, however, are currently aspiring to attain the same level of welfare and security available to their industrialised neighbours. And while we may reasonably guess that industrial society, or something about it, is the cause of our present misfortune, we are at the same time faced with the reality that the lifestyle that our society has furnished us with may be called into question, and our supporting social structures may have to be changed.

In this assessment, however, there remain several great unknowns. Time, in this case, is possibly mankind's most valuable commodity: given enough time, we have reason to believe that the environmental crisis that we have wrought upon our world may be un-wrought, or at least, re-made in a way that balances our interests with the needs of the web of life that supports us; otherwise, there may be disaster. We do not know the amount of time that we have available - whether this crisis is an immediate threat requiring further global cooperation to literally re-build our societies, or whether the action we have taken in the many years since the problem first became the subject of international concern will be enough to set us on a new course that will bring us in line with the limits of our finite planet. From a scientific point of view, we do not know enough to fully understand the changes that we are making in the natural systems around us. We do not know enough to make all of the connections and, importantly, we lack the information or the skill to assess the consequences of both our actions and our inaction. For a society that is ostensibly built on rational thinking, these unknowns have the potential to create a deep social paralysis.

From the outset, then, and despite the uncertainty that plagues the environmentalists' assertion, this thesis assumes that there is an environmental crisis, that it has global implications, and that these implications are serious enough to warrant genuine concern. As a provision, however, a critical attitude is to be maintained. The task of this section is to chart the process through which sufficient conviction can be mustered to cause the global community to spring into focussed and possibly even radical action. The mustering is accomplished through a global process of negotiation and compromise that has been referred to the as the environmental discourse. The understanding to be offered here includes then,

both our comprehension of the problem and the conceptual framework that has given rise to the proposed solution. In putting forward these components of the environmental discourse, this section must develop an understanding of which information is taken in to the discourse without immediately passing judgement on its truth in absolute terms. The framework presented in this section, then, contains both the understanding of the problems that we face and an explanation of how we are to solve them.[15]

The *Selected History of the Modern Environmentalist Discourse* which follows provides the context for our understanding of the environmental crisis. The topics selected for the history each add important elements to the development of a way of looking at the environmental crisis that has produced sustainable development as a global solution. The importance of these elements stems from their impact on the environmentalist discourse - not because they are the foundation for the principle of sustainable development but because they influenced the current form that it has taken. There are certainly traces of all of these works present in sustainable development. This context is important because it helps explain some of the confusion and contradictory elements of the environmentalist discourse.

The context given here is, however, a partial one chosen for its direct relevance to the North American experience. The global effort to solve the environmental crisis has of course included the input of many distinctly different cultures, each of which would have a particular cluster of events that would have lead them into the global dialogue but there are particular reasons for focussing on the North American experience. Citizens of developed countries live differently than the rest of the world. The high level of welfare, which is characterised by great material wealth and security, has been achieved through the intensive use of energy and material resources. The reliance on these resources has lead to a relationship with the natural world that is, in popular terms, unsustainable. Societies in the developed world also work actively to export their own culture and with it the values that have lead us to put our welfare as a contradiction rather than a compromise next to concern for the environment.

The last chapter of this section, *The Conceptual Framework for the Ecological Crisis*, deals more specifically with the global experience. The conceptual framework is about sustainable development itself beginning with the way that the main document of sustainable development, *Agenda 21*, was produced and then discussing the many complications with both the finished document and the way that it was arrived at. Here, the full range of biases and needs of all contributory to the environmentalist discourse come into play, whether from Northern developed countries or the developing South, from a secular base or a religious one, or from a fundamental concern for the protection of life or from a profit motive. Finally, in this chapter, the unresolved problems with sustainable development are discussed.

---

[15]We have within our cultural structure, a mechanism for dealing with the unknown. The value that we place or find in the elements of the world around us together with the communication of this value through moral and ethical systems, has in the past been the enduring system for protecting the balance between our society and the natural world. This value-structure is the fundamental part of the framework that we develop for our understanding but is discussed as a cultural system only in the final section of this thesis.

A Selected History of the Modern Environmentalist Discourse

Before the Environmentalist Movement

There is a long history of concern for the environment that has now come to be embodied in the environmentalist tradition. From antiquity, what the natural world has meant to human society at different times and in different places has changed, gradually and not completely, from the seat of divinity, to the object of stewardship, to the source of the wealth and power of nations. At all times, the environment has been seen as the context for human activity, and nature as the capricious but constant moderator of human interest.

The environmental movement, however, holds a distinct view of the relationship between our society and the natural environment that is not fully expressed by any of these historical views. Environmentalists, in scientific and sometimes spiritual terms, maintain the view that the environment's natural processes are the source and support for our life. Further, they insist that the environmental impact of our society is inflicting damage on the core capacity to support life with such ferocity that there is reason to doubt nature's continued ability to fill this role.

The writing of three pre-environmentalist thinkers, Jean-Jacques Rousseau, Henry David Thoreau and John Muir,[16] reviewed in the pages that follow is intended to show the roots of this rather sudden change in the understanding of our position in the environment. The literary style of the three also serves as an introduction to the work of Rachel Carson, the first wholly environmentalist writer reviewed in the selected history of the environmentalist discourse that follows.

These writers share a common distain for the perceived immorality of society, which is evidenced by both social injustices and the destructive changes wrought on the world around them. For each of these writers there was a connection between the two. The

---

[16]Enlightenment philosopher Jean-Jacques Rousseau (1712-1778) put forward the idea of humanity's natural goodness. He argued that this 'noble savage' has been progressively corrupted by society, that sentient animals ought to be entitled to natural rights, and that the unnatural inequality in society could be eliminated by individual liberty and self-rule.

Henry David Thoreau (1817-1862), through fiery, poetic writing about his own experience, presented the possibility of realising an existential connection to the 'Wild.' His close observations of the natural world offered a base for his strongly humanist criticisms of society and his compelling arguments for natural preservation, but his appeal for a new relationship with nature has extended the influence of his work to more radical environmentalist thinkers.

John Muir (1838-1914), gave a life-long account of the spirituality that he saw in the wilderness. He had a firm conviction later picked up by others that exposure to the 'immortal beauty' of the natural world would lead to a new environmentalist ethic, one that could accommodate the need to protect the wilderness and would reward the American public with a renewed sense of connection to the divine. (see Palmer, Joy A. ed. *Fifty Key Thinkers on the Environment.* New York: Routledge, 2001. Pages 56, 106, 131)

resolution was to look back to the natural world: in Rousseau's case it was the basic goodness of humanity in a natural state, for Thoreau the lessons that reflective study of nature could teach, and for Muir it was a sense of spirituality to be gained from the wilderness untouched by human activity. Their arguments for a new or renewed moral relationship with nature instilled in the more modern discourse a different sense of value for the beauty and integrity of nature and of respect for the natural world as an existential complement to the environment that humans have built for themselves.

With the sense of value for the relationship between humans, human society and nature, environmentalism has developed a perspective that allows for and perhaps inherently encourages an objective look at our society.[17] The ongoing comparison of the operation of our society to that of nature recalls a more ancient search for ideals through which our society can be absolutely measured. But although the writings of the Romantic Naturalists, not surprisingly, turn to moral language to express what they have found, they hold the natural world up as an ideal that is not abstract, not a symbol for something more ephemeral, but an accessible and practical model. Thoreau's friendship with Louis Agassiz, one the early ecologists,[18] lent to his work a more scientific tone - an influence that logically followed from his belief that nature could teach moral lessons rather than, as has been said, the more ancient practice of demonstrating that nature acted as a symbol for something else. Environmentalism, through the explanations of the potential fullness of man's relationship to the natural world made by the Romantic Naturalists, began as a social and moral commentary on our society before naturally accruing the language and attitudes of science to carry forward its important investigation.

In the late nineteenth and early twentieth century the need for protection of the environment was formalised into the conservationist movement. The conservationist movement had by this time developed a conceptual framework that rested on several distinct trends. First, increasingly rapid depletion of natural resources by activities such as forestry, mining and agriculture called for management methods that would ensure a continued supply for human use. Secondly, there was growing interest in the availability of wilderness areas for recreational purposes. More traditional activities such as hunting and fishing were becoming popular, partly due to the influence of the Romantic writers discussed above. Finally, the idea that important lessons could be learned from the natural world, whether through spiritual or scientific inquiry, brought with it the increasing sense that the wilderness needed to be preserved for itself or for some more distant benefit to society. Between these reasons, both the popular and economic sides of the conservationist movement can be found.

Many of the interest groups that are today connected to the environmental movement can trace their roots back to these motivations. John Muir founded the Sierra Club in 1898 to prevent environmental destruction.[19] Hunting associations also expressed

---

[17]For architects, this is a valuable perspective that allows a critical view of our basic concern for the creation of the human environment.

[18]Swiss natural scientist Louis Agassiz was mentored by Alexander von Humboldt who, besides influencing the work of Charles Darwin and Charles Lyell, was a catalyst in the creation of the science of ecology. (see Palmer, page 108)

[19]The Sierra Club was founded on May 28, 1892 to promote respect for the natural state of the mountain regions of the Pacific coast through education, recreation and conservation. (The Sierra Club, www.sierraclub.org/history/origins/chapter3.asp)

interest in maintaining a healthy environment to support their sport and other recreational activities. Noted conservationist Aldo Leopold[20] explains how overlapping motivations for wilderness preservation go deeper than the obvious self-interest of having available game to shoot. Many people, he claims, take up hunting as a way of securing a solitary connection to the natural world through an activity that, by necessity, breeds a heightened sensitivity to the workings of nature.

As the conservation movement struggled against the loss of wilderness areas, writers such as Aldo Leopold, were faced with convincing a public that was becoming more and more separated from nature. Since the reality of what was happening could not be experienced by the public at large, it had to be explained as part of the argument for protection. For this reason, a pattern exists in writing about the environment: What people could not see, they could not be expected to care about and because they could not notice the sometimes subtle changes to the world beyond their city limits, they first had to be made aware. Conservationist writing has a characteristically vivid illustration of nature, borrowed from Rousseau, Thoreau and Muir, that has been identified with the environmentalist movement from this point forward.

The roots of the environmentalist movement can certainly be found in the romantic and conservationist attitudes towards nature but a clear distinction needs to be drawn between those and the environmentalist movement. Together these historically linked movements deal with some of the same basic issues and often appear to have the same view but, in fact, have very different conceptual frameworks. What Rousseau, Thoreau, Muir and later Leopold identified as a problem with our relationship with the environment is now identified as an ecological crisis. Although in the environmentalist discourse the tone of argument, the imagery and some of the important issues are the same as has been discussed above, the level of understanding of the impact of human activity on the environment, the scale of the damaging influence, and the appreciation of the depth of the problem are very different. The differences are explored in the selected history that follows. The history is composed of theories and events that are significant because they contribute to the distinct character and content of the environmentalist perspective.

Silent Spring – Rachel Carson

Rachel Carson's *Silent Spring* serves as an appropriate starting point for discussing the modern environmentalist discourse because of Carson's success in bringing environmentalist issues to the attention of the general public. The book is arguably not the only example of how the widespread impact of industry became apparent to the public as a general concern but it had without question the most significant impact on public awareness. Written in 1962, *Silent Spring* speaks about the extent of our industrial society's involvement with the environment. Specifically, the book presents the previously underappreciated

[20]Aldo Leopold (1887-1948) was a primary contributor to the conservation movement. His work in forestry and game management led to the development of significant conservationist regulations but the years of working with many types of organisational and governmental regulation convinced him that what was needed to ensure the gains of the conservation movement was an environmentalist ethic shared by all stakeholders. (Zimmerman, Michael E., et al., ed. *Environmental Philosophy: From Animal Rights to Radical Ecology.* 2nd Ed. New Jersey: Prentice-Hall Inc., 1998. Page 87)

danger of the inadvertent poisoning of the environment by modern pest control strategies. Carson, a chemist and a biologist, gives an in depth and scientific account of the chemicals, their intended use, as well as their unintended effect on living beings.

Carson details the use of man-made chemicals in the agriculture and forestry industries. These chemical pesticides and herbicides and their methods of application were developed during the Second World War and, by the 1950s, had recently been modified for industrial use.[21] Chemicals to control unwanted insect and plant populations were routinely released over large areas by airplanes. The intended results were often successful in the short term but within a few years of repeated applications became significantly less effective, triggering a development sequence that usually lead to more and more toxic chemicals and a wider area of release into the environment. Rachel Carson's book gave the public an uncomfortable introduction to the unintended effects of these habits.

In *Silent Spring*, the ecological consequences are made directly relevant to ordinary lives. Carson tells of the poisoning of people by control programs that were paid for with their own tax dollars. For example, during a program designed to control the gypsy moth:

> "planes hired by the United States Department of Agriculture and the New York Department of Agriculture and Markets in 1957 showered down the prescribed DDT-in-fuel-oil with impartiality. They sprayed truck gardens and dairy farms, fish ponds and salt marshes. They sprayed the quarter-acre lots of suburbia, drenching a housewife making a desperate effort to cover her garden before the roaring plane reached her, and showering insecticide over children at play and commuters at railway stations. At Setauket a fine quarter horse drank from a trough in a field which the planes had sprayed; ten hours later it was dead. Automobiles were spotted with the oily mixture; flowers and shrubs were ruined. Birds, fish, crabs, and useful insects were killed."[22]

She speaks about the high probability that residual poisons are left on foods after harvest and shipping to the marketplace:

> "The fact that every meal we eat carries its load of chlorinated hydrocarbons is the inevitable consequence of the almost universal spraying or dusting of agricultural crops with these poisons. If the farmer scrupulously follows the instructions on the labels, his use of agricultural chemicals will produce no residues larger than are permitted by the Food and Drug Administration. Leaving aside for the moment the question whether these legal residues are as ‘safe' as they are represented to be, there remains the well-known fact that farmers frequently exceed the prescribed doses, use the chemical too close to the time of harvest, use several insecticides where one would do, and in other ways display the common human failure to read the fine print"[23]

Through these descriptions, Carson portrays our use of dangerous chemicals as utterly irresponsible - almost in absolute denial of their harmful effects on human and animal life.

Carson criticises a number of assumptions behind the design of the control

---

[21]Insects were used to test chemical weapons designed to be used on men. (Carson, Rachel. *Silent Spring*. New York: Mariner Books/Houghton Mifflin Company, 2002. Page 16.)

[22]Ibid., page 158.

[23]Ibid., page 180.

programs: that poisons, such as DDT, act selectively on the pests populations without harming other forms of life; that chemical poisons behave in the environment the way that they do in the controlled conditions of the laboratory; and that there is some level of poison in the environment that can be considered safe. She demonstrates that despite available scientific proof to the contrary, these assertions were used to encourage the mistaken belief that the insecticides and herbicides are effective in controlling pest populations and even safe for household use. Carson claims that if long-term field testing had been done, the government would have discovered that these assumptions are wrong. She charges that by relying on private research provided by chemical manufacturers rather than, in some cases, that of publicly-funded experts, the government put citizens in the position of accepting unknown consequences for their health: effectively allowing the "contamination of public food supplies with poisonous chemicals in order that the farmer and the processor may enjoy the benefit of cheaper production."[24]

The illogical reluctance to engage in cautious scientific evaluation of chemical use further complicated the fact that the pest control programs were not working in the long term. Carson describes studies which demonstrate that in the control program area, populations of the plant or insect pests routinely increased in the years after the treatment program.[25] The response of those administering the program was to return to the area with more deadly poisons and an enlarged area of distribution but the results were the same.

Carson explained what was happening from a biological perspective. First, the farmland and commercially important forests attacked by the plant and insect pests, had been changed by years of human activity into mono-cultural ecosystems. The resulting lower number of predators and abundance of food provided prime conditions for the growth of pest populations. Secondly, since the poisons used were not selective in their action (as was popularly advertised) they had a wider effect than intended. In the field, it was commonly found that the return of pest was encouraged by the fact that the populations of natural predators were destroyed or diminished to the point where they could not act effectively as a control over the pest population. When the pests returned, they were given a more advantageous position in the ecosystem than they had before human intervention.

A second failure of the chemical control approach was the creation of a physical resistance to the pesticides in the insects themselves. Carson explained that in the new toxic conditions created by residual poisons in the environment, pests were able to adapt quickly:

> "Out of an original population, the members of which vary greatly in qualities of structure, behaviour, or physiology, it is the ‘tough' insects that survive chemical attack . . . . These are the parents of the new generation, which, by simple inheritance, possesses all the qualities of ‘toughness' inherent in its forebears. Inevitably it follows that intensive spraying with powerful chemicals only makes worse the problem that it is designed to solve. After a few generations, instead of a mixed population of strong and weak insects, there results a population consisting entirely of tough, resistant strains."[26]

---

[24]Ibid., page 183.

[25]In one example, the population of blackflies in Ontario increased by 17 times after spraying. In another, a new pest population more destructive than the first replaced the original target population. (Ibid., page 252)

[26]Ibid., page 273.

Carson shows that these problems are related to a poor understanding of the way the biological components of the environment work and a misplaced confidence in the understanding of the effects of the chemicals employed. The result, she claims, is that "By their very nature chemical controls are self-defeating, for they have been devised and applied without taking into account the complex biological systems against which they have been blindly hurled."[27]

The most sinister unintended consequence of the chemical control programs is the cumulative effect of these poisons in the environment. She pointed out a number of chemicals commonly used in industrial products that have extreme durability when release into the natural world. Outside laboratories, these chemicals or combinations of chemicals tended to find their way into the chain of living beings. Through plants and insects, these chemicals were absorbed. Even if the organism is killed by the poison, the undeteriorated amount can be passed on to other organisms higher up the food chain. Because of the unnatural origin of these chemicals or compounds, few organisms had natural processes that were able to break them down into non-toxic components. The result being that these poisons, once allowed into the food chain, find their way from body to body from the lower, microscopic forms of life up to the larger, more sophisticated animals. Humans beings are shown to be inescapably part of this chain. Worse, the concentration of poisons in any given body was found to be higher in larger animals.[28] The chemicals, not being dissolved by any process in the smaller organisms, tended to accumulate in the larger ones. Thus, widespread distribution of a trace amount of poison over a large area would eventually and inevitably result in the appearance of larger and often lethal amounts of poison in the larger animals. The concentration of chemicals goes against the expectation that trace amounts in the environment would either decompose or disperse harmlessly. The potential result was the unnoticed destruction of the carefully balanced web of life.

The image of the future that Carson presents as a possible result of our poisoning of the environment is based on a combination of these factors. Carson warns that in some parts of the country, the ‘silent spring’ had already occurred. She points out that the same process is happening in many areas, not only in remote locations where logging was taking place or on particular farms in particular parts of the country but generally in towns, fields and forests in all industrialised countries. In Canada, for example, commercial forests in the Miramichi region of New Brunswick were subjected to repeated spraying of DDT through the 1950s in an effort to control the spruce budworm. Carson describes the findings of a Fisheries Research Board of Canada study:

> "The survey showed more than the loss of young fish; it revealed a serious change in the streams themselves. Repeated sprayings [up to 1962] have now completely altered the stream environment, and the aquatic insects that are the food of salmon and trout have been killed. A great deal of time is required, even after a single spraying, for most of these insects to build up sufficient numbers to support a normal salmon population – time measured in years rather than months."[29]

---

[27]Ibid., page 146.

[28]Bio-accumulation of toxins is one of the reasons why many of the species that are currently on the endangered list are carnivores at the top of an ecosystem's food chain.

[29]Ibid., page 132.

Carson discusses the problem of food-stock fish killed by runoff of agricultural chemicals in Rhodesia, the Philippines, China, Vietnam, Thailand, Indonesia, and India.

> "In the Philippines aerial spraying for mosquito control has cost pond owners dearly. In one such pond containing 120,000 milkfish, more that half the fish died after a spray plane had passed over, in spite of desperate efforts by the owner to dilute the poison by flooding the pond."[30]

She discusses how commonplace our attitude towards chemicals has become:

> "So thoroughly has the age of poisons become established that anyone may walk into a store and, without questions being asked, buy substances of far greater death-dealing power than the medicinal drug for which he may be required to sign a 'poison book' in the pharmacy next door. A few minutes' research in any supermarket is enough to alarm the most stouthearted customer – provided, that is, he has even a rudimentary knowledge of the chemicals presented for his choice."[31]

Stories of this type firmly emphasise the connection between the damage to the environment and our attitude towards the industrial use of chemicals, making it impossible for readers to conceive of the problem as a local one associated with a single government, a single company or a single ecosystem. The final chapter of Carson's book is filled with successful examples of how a scientific understanding of biology and ecology can be applied to the same problems that we currently employ dangerous chemicals to solve. Although her work contains this very positive view of the contribution of science, the tone of her writing makes clear her understanding of the basic crisis within the industrial community.

People, in general, got the point. Governments were forced, against the will of large chemical manufacturers, to ban some of the worst chemicals and severely restrict the use of many other toxic substances.[32] The effect on the popular culture was enormous. Through Carson's work, the language of ecology has become fundamental to our understanding of the environmental problem. The characterization of the problem as a crisis also has had a lasting effect on our understanding. The idea that we are connected to other forms of life has formed the basis for much of the continued discussion about the environment. The stories that Carson gives also serve to illustrate the widespread application of solutions—significant both in the amount of area that is affected and also in the range that these solutions have—they are a part of our culture and naturally transcend geography. Here there is evident a belief in a technical solution as posed by a scientific way of understanding the world. There is not, however illogical it may seem, much evidence of a corresponding use of the same scientific approach to look for the real effects of chemical use in the environment. Basic falsehoods such as the limitlessness of the earth's atmosphere are still a

---

[30]Ibid., page 144.

[31]Ibid., page 174.

[32]This is not, however, to say that the same kind of thing doesn't happen today. It is interesting to note that despite the huge influence of Carson's study the same basic practices have not effectively changed—the effect has been more on awareness and not actually a change to the way that society works or values the environment.

part of the view of the earth that underlies the decisions that we make. The understanding changed in the course of the book from a set of problems that were particular to a given region in one part of the country to an effective illustration of a related sequence of events that pervades all geographic areas governed by our culture—the repetition of solutions that is so much a part of the industrial society is shown by Carson to be a major cause of the spread of these poisonous chemicals to every area that humans inhabit. All of these points have become part of what we know as the modern environmental discourse.

Selected Events Contributing to the Environmental Discourse [33]

The following list of events gives an overall impression of the development of a global awareness of environmental issues. What begins as localised concern spreads through a series of international events to include a complex set of problems affecting people in all parts of the globe. The entries marked in bold are discussed in this section.

1960

1962 **Marine biologist Rachel Carson publishes Silent Spring, calling attention to the threat of toxic chemicals to people and the environment**

1968 Paul Ehrlich publishes The Population Bomb describing the ecological threats of a rapidly growing population.

1968 Experts from around the world meet for the first time at the UN Biosphere Conference to discuss global environmental problems, including pollution, resource loss, and wetlands destruction.

1970

1970 The first Earth Day is held in the United States. Millions of people gather around the country to demonstrate against environmental abuses, sparking the creation of landmark environmental laws including the Endangered Species Act and the Safe Drinking Water Act.

1971 2,200 scientists, gathered for a conference in Menton, France, present a message to the UN stressing the need for environmental action: "Solutions to the actual problems of pollution, hunger, over-population, and war may be more simple to find than the formula for the common effort through which the search for the solutions must occur, but we must make a beginning."

1972 **Participants from 114 countries come to Stockholm, Sweden for the UN Conference on the Human Environment. Only one environment minister attends, as most countries do not yet have environmental agencies. The delegates adopt a set of 109 specific recommendations for government action and push for the creation of the UN Environment Programme.**

1972 **The Club of Rome, a group of economists, scientists, and business leaders from 25 countries, publishes The Limits to Growth, which predicts that the Earth's limits will be reached in 100 years at current rates of population growth, resource depletion, and pollution generation.**

1973 Women living in Himalayan villages in Northern India begin the Chipko movement to protect trees from clearing by commercial logging, which has begun to cause severe deforestation soil erosion, and flooding in the region.

1973 Arab country members of the Organization of Petroleum Exporting Countries (OPEC) reduce oil exports to Europe and initiate an oil embargo against the United States for its support of Israel in a war with Egypt and Syria. Ineffective policies to reduce oil dependence leave industrial countries vulnerable to Iran's 1979 revolution and subsequent reduction in oil production, sparking a second energy crisis.

1973 The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) restricts trade in roughly 5000 animal species and 25 000 plant species that are near or threatened with extinction. While the treaty has a broad mandate, inadequate enforcement

[33]Adapted from Runyan, C. and Norderhaug, M. "The Path to the Johannesburg Summit," *World Watch*, May/June 2002, Vol.15, Issue 3.

in the following years allows a billion dollar black market in wildlife trade to flourish.

1976 the UN Conference on Human Settlements in Vancouver, British Columbia, Canada, drafts 65 recommendations for countries about how best to provide shelter. Conference participants agree that adequate shelter is a basic human right.

1980

1982 The Law of the Sea provides a comprehensive framework for ocean use and contains provisions on ocean conservation, pollution prevention, and protecting and restoring species populations.

1982 The UN Environment Programme organizes a special Stockholm +10 conference in Nairobi. The attendees agree to a declaration expressing "serious concern about the present state of the environment," and establish an independent commission to craft a "global agenda for change," paving the way for the release of Our Common Future.

1983 The US Environmental Protection Agency and the US National Academy of Science publish reports finding that the build-up of carbon dioxide and other "greenhouse gases" in the Earth's atmosphere will lead to global warming.

1984 An estimated 10 000 people are killed and many more are injured when Union Carbide's pesticide plant in Bhopal, India leaks 40 tons of Methyl Isocynanate gas and sends a cloud of poison into the surrounding city of 1 million.

1986 One of the four reactors at the Soviet Union's Chernobyl nuclear power plant explodes after a botched "safety test" and completely melts down. The explosion sends radioactive particles as far away as Western Europe, exposing hundreds of thousands of people to high levels of radiation.

1987 The World Commission on Environment and Development publishes Our Common Future (The Brundtland Report), which concludes that preserving the environment, addressing global inequities, and fighting poverty could fuel, not hinder, economic growth by promoting sustainable development: "Attempts to maintain social and ecological stability through old approaches to development and environmental protection will increase instability."

1987 The Montreal Protocol, which has been strengthened since its inception, now requires industrial countries to phase out production of a number of ozone-depleting chemicals by 1996, and developing countries by 2010.

1987 The Basel Convention controls movement of hazardous wastes across borders and now outlaws exports of wastes from developed to developing countries for final disposal.

1988 Biologist E.O. Wilson publishes Biodiversity, a collection of reports from the National Forum on BioDiversity in the United States. The book details how humans are rapidly undermining the Earth's ability to support its diversity of species.

1989 An inexperienced crewman runs the Exxon Valdez oil tanker onto a reef in Alaska's Prince William Sound, dumping 76 000 tons of crude oil. The spill, the largest ever in the United States, covers more than 5100 kilometers of pristine coastline with oil and kills more than 250 000 birds.

1990

1991 The Iraqi army, retreating from its occupation of Kuwait, destroys tankers, oil terminals, and oil wells, setting many on fire. The fighting and sabotage leak approximately 1.25 million tons of oil, the worst oil spill in history.

1992 Bringing together 1575 scientists from 69 countries, the Union of Concerned Scientists issues its World Scientists' Warning to Humanity, which states that "Human beings and the natural world are on a collision course."

1992 The Convention on Biological Diversity mandates that countries formulate strategies to protect biodiversity and that industrial countries help implement these strategies in developing countries.

1992 Most countries and 117 head of state participate in the groundbreaking UN Conference on Environment and Development, in Rio de Janeiro, Brazil (The Earth Summit). Participants adopt Agenda 21, a voluminous blueprint for action that calls for improving the quality of life on Earth by using natural resources more efficiently, protecting global commons, better managing human settlements, and reducing pollutants and chemical waste.

1992 The Convention on Climate Change sets nonbinding CO_2 reduction goals for industrial countries (to 1990 levels by 2000). The final treaty calls for avoiding human alteration of the climate but falls far short of expectations, largely due to lack of support from the United States.

1994 183 countries send delegates to the Conference on Population and Development in Cairo, Egypt, where they set up a decades-long plan to stabilize and reduce population growth – a plan that emphasizes the importance of women's education and access to reproductive health care.

1995 The International Panel on Climate Change (IPCC), a group of hundreds of prominent climate scientists assembled by the UN in 1988, releases a report concluding that "the balance of evidence suggests that there is a discernible human influence on global climate."

1996 Theo Colborn, John Myers, and Dianne Dumanoski publish Our Stolen Future, which warns of reproductive threats to animals – including humans – due to the release of billions of pounds of synthetic chemicals into the environment, many of which mimic and disrupt natural hormones.

1996 William Rees and Mathis Wackernagel publish *Our Ecological Footprint,* which measures in equivalent area the amount of land required to support our society. The method reveals that for the entire population of the world to live according to the North American lifestyle, humanity would require the resources of at least three Earths (and possibly as many as eight) - a clear challenge for future development.

1997 The Kyoto Protocol strengthens the 1992 Climate Change Convention by mandating reductions of 6 to 8 percent from 1990 emission levels by 2008 to 2012 for industrial countries. But the protocol's controversial emissions-trading scheme and debates over the role of developing countries cloud its future.

1998 The Sustainable Building Conference in Vancouver starts a series that will become the largest international gathering on sustainable development. Attendance at the conference is 600 in 1998, 800 in 2000 and 1000 in 2002.

2000

2000 The Biosafety Protocol implements a more precautionary approach to trading genetically altered crops and organisms, and requires exporters to receive prior consent from destination countries before shipping genetically altered crops.

2000 The Treaty on Persistent Organic Pollutants requires the complete phaseout of nine persistent, highly toxic pesticides and limits the use of several other chemicals, including dioxins, furans, and PCBs.

2001 US President George W. Bush announces that the United States will not ratify the Kyoto Protocol, saying that the country cannot afford to reduce CO2 emissions.

2001 The $3 billion Human Genome Project reports that the human gene count is only about 30 000 – about the same as that of a weed or a mouse – not 100 000 as expected. News of the finding adds to the concerns about the wisdom of current efforts at genetic manipulation, including inserting genes into food crops and re-engineering animals or humans.

2001 The IPCC releases a new report citing "new and stronger evidence that most of the observed warming in the last 50 years is attributable to human activities." The new study projects that at current rates, temperatures will increase by 1.4 to 5.8 degrees C by 2100.

Early Environmental Politics

As a result of growing concern for environmental issues, the United Nations hosted the first world comprehensive conference on environmental issues in Stockholm, Sweden in 1972. The UN Conference on the Human Environment was a follow up to a 1968 meeting which outlined a number of environmental issues, including air pollution. The Stockholm conference responded to the growing realization that pollution was not limited to the country of origin. The fact that atmospheric pollution was able to travel great distances into other countries was increasingly a concern for Sweden, the host of the conference, and therefore became a focus for the discussion.

Prior to 1972, air pollution was pictured as a local problem, connected with cities and specific industries. Since the beginning of the industrial revolution, urban air pollution in cities that had large factories was an enormous problem. Smoke produced in factories generally stayed in the immediate area of the plant, with the damage to the environment creating a clear link between the problem and the source. The over 3000 deaths attributed to London's so-called 'killer fog' of 1952 brought air pollution to international attention. The chemical fogs, which were not uncommon in densely populated cities, were caused by a combination of smoke released into the immediate airspace by the large concentration of

factories and uncommon atomospheric conditions.[34] Smoke from wood and coal stoves used to heat houses within the city also contributed to the air pollution.

The governmental response to the increasing awareness of local air pollution was to deal with the problem by treating the symptoms. It was widely believed that pollution represented only a minor problem requiring small adjustments to the industrial process. This first round of environmental legislation was an overly simplistic response and its ineffectiveness became obvious quickly. One common approach to reduction of pollution was to build increasingly large smoke stacks to push pollutants up into the atmosphere in the hopes that the unwanted chemicals would be diluted and distributed over a wide area. The result of this strategy was an immediate reduction in air pollution in the surrounding area.[35] The unforeseen result was that the chemicals were taken up into the water cycle—trapped in clouds and returned to the Earth in the form of chemically induced acid rain. The area of deposition for this harmful mixture was sometimes hundreds of kilometres away from the point of initial pollution. The country receiving the unwanted chemicals in this form generally experienced degradation of the natural environment. In northern Ontario, the destruction of water and forest ecosystems in the wild by air pollution from Southern Ontario and the northern United States has been well documented. In Sweden, international cooperation to deal with air pollution became a necessity after thousands of lakes and forests were shown to have suffered severe damage from acid rain produced in Northern European industrial countries.[36]

The participants in the Stockholm Conference were largely Northern countries with industrial economies and those less developed neighbours who were affected by the airborne pollution. Although significant disagreement was encountered over the compromise between economic development and efforts to control the spread of pollution, a collaborative spirit for the negotiations was established that has since become characteristic of the global environmentalist discourse.

---

[34] "Long known for its foggy weather and coal-burning homes, power plants, and factories, London, England, experienced a dense smog from 5 December to 9 December 1952. According to official government reports, this lethal fog resulted in about 3,000 more deaths than normal during the first 3 weeks of December 1952. With a death rate more than 3 times the norm for this period, the London fog of 1952 is widely regarded as a catalyst for the study of air pollution epidemiology." (Bell, ML and DL Davis. "Reassessment of the lethal London fog of 1952: novel indicators of acute and chronic consequences of acute exposure to air pollution" *Environmental Health Perspectives* Volume 109, Supplement3, June 2001:389-94.)

[35]The 381m "Super Stack" at Inco's Copper Cliff nickel smelter near Sudbury was one of the first major efforts to reduce destruction of the local ecosystem by discharging emissions high into the atmosphere. There was an immediate reduction in air pollution in the Sudbury region when the giant chimney was built in 1972. Today however, the enlarged radius of $S0_2$ influence is clearly understood and is known to include Algonquin National Park some 200 km away. Efforts are underway to achieve lower emissions and then reduce the size of the stack to minimise this long-range influence.
(report taken from the Algonquin Eco Watch Group. "SuperStack Update" *Fall Update 2003*, www.algonquin-eco-watch.com/fall_update_2003.htm)

[36]Hajer, Maarten A. *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*. Oxford: Clarendon Press, 1995. Pages 5-6.

The primary success of the conference was to organise the United Nations Environment Programme (UNEP)[37] which in turn led to a series of conferences and many multi-lateral international agreements. At the conclusion of the Stockholm conference the participants released a declaration that included the following significant points. First, they recognised that the "natural and the man-made" environment are essential to "his well-being and to the enjoyment of basic human rights the right to life itself" (Declaration 1).[38] The declaration lauded the benefits of modern science and technology, but at the same time recognised the increasing damage to the environment as "harmful to the physical, mental and social health of man" (Declaration 3). The increasing degree of damage to the environment in under-developed countries was linked to the pressures of rapidly growing populations and poverty. In developed countries, the environmental problems were seen to be "related to industrialization and technological development" (Declaration 4). But with the social, economic and technological development, the participants of the Stockholm conference saw that "the capability of man to improve the environment increases with each passing day" (Declaration 5). The agenda, then, that was outlined for the UNEP in the Stockholm declaration was to safeguard the future welfare of the growing world population by encouraging greater international cooperation to solve environmental problems and promoting social, economic and technological development. The solution to the problems in the environment was thereafter tied to issues of global development. With this, the international community began a concerted effort to develop a common approach to what was now known as a global environmental crisis.

Limits to Growth

In 1972, a second significant event changed the understanding of the environmental problem. The Club of Rome, an international association of scientists, policy-makers and business leaders, presented a report on the status of the world population and the predicted chances for humanity in the future. The report, titled *Limits to Growth*, was based on the work of researchers at MIT who had developed a computer driven model of the world. The report had a distinctive sense of urgency about the patterns of growth. In particular, the computer model illustrated the consequences of growth at an exponential rate in a finite world. A story presented with their work shows their cause for concern clearly:

> "A French riddle for children illustrates another aspect of exponential growth—the apparent suddenness with which it approaches a fixed limit. Suppose you own a pond on which a water lily is growing. The lily plant doubles in size each day. If the lily were allowed to grow unchecked, it would completely cover the pond in 30 days, choking off the other forms of life in the water. For a long time the lily plant seems small and so you decide not to worry about cutting it back until in covers half the pond. On what day will that be? On the twenty-ninth day, of course. You have one day to

[37]The mission of the UNEP is "To provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations." (www.unep.org)

[38]The Stockholm Declaration, UNEP. (www.unep.org/Documents/Default.asp?DocumentID=97)

save your pond."[39]

They claimed that the deceptive nature of growth in an exponential fashion had caused people in general to be unaware of the true gravity of our shared situation. The authors of *Limits to Growth* are not interested in just the rate of growth and they do not seriously question whether growth is needed, they are primarily concerned with what they see as obvious limits to available resources, energy and living space. With regard to pollution, as an illustration of their point, they observed four points:

1. The few kinds of pollution that actually have been measured over time seem to be increasing exponentially.
2. We have almost no knowledge about where the upper limits to these pollution growth curves might be.
3. The presence of natural delays in ecological processes increases the probability of underestimating the control measures necessary, and therefore of inadvertently reaching those upper limits.
4. Many pollutants are globally distributed; their harmful effects appear long distances from their points of generation.

Here the authors present problems that have to do with knowledge and time. The report emphasises the lack of knowledge that scientists have about natural processes and the effect of our activity on them. They underlined the fact that in general the global community was not making decisions about the environment with an understanding of the full possible consequences. The group points out that this knowledge is critical to even a general prediction of the future. In Figure 1 below, two possible scenarios are illustrated. To the left a graph shows population growth slowing and eventually balancing as it approaches the earth's carrying capacity. Note that the population temporarily exceeds the safe carrying capacity before dropping below the line. To the right the graph shows a dynamic relationship between population and carrying capacity where the actual safe capacity of the earth is eroded as population increases. While over-population can be supported for a short time, the population level falls drastically to a much lower final level than in the graph to the left.

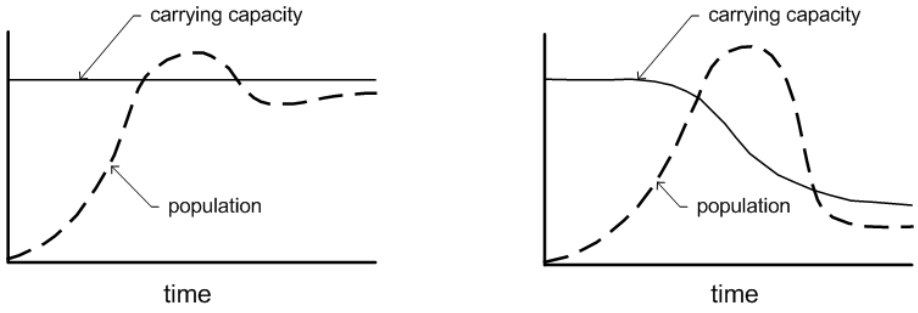


Figure 1: Stabilised Population levels (left) and Reduced Carrying Capacity (right)[40]

With regard to time, the report outlined what the authors thought was the best

[39]Meadows, Donella H. et al. *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind.* New York: Northpoint Press, 1972. Page 29.

[40]Adapted from ibid., page 92.

available estimate of the effect of our current behaviour over the long term but emphasised the uncertainty caused by our lack of knowledge about the interlinked effects of population growth and resource use. The output plots of the MIT model included both the effect of our civilization on the natural world and on our own ability to adapt to changing conditions. Figure 2 gives an example of what the consequences of failing to change our global society and values might be.

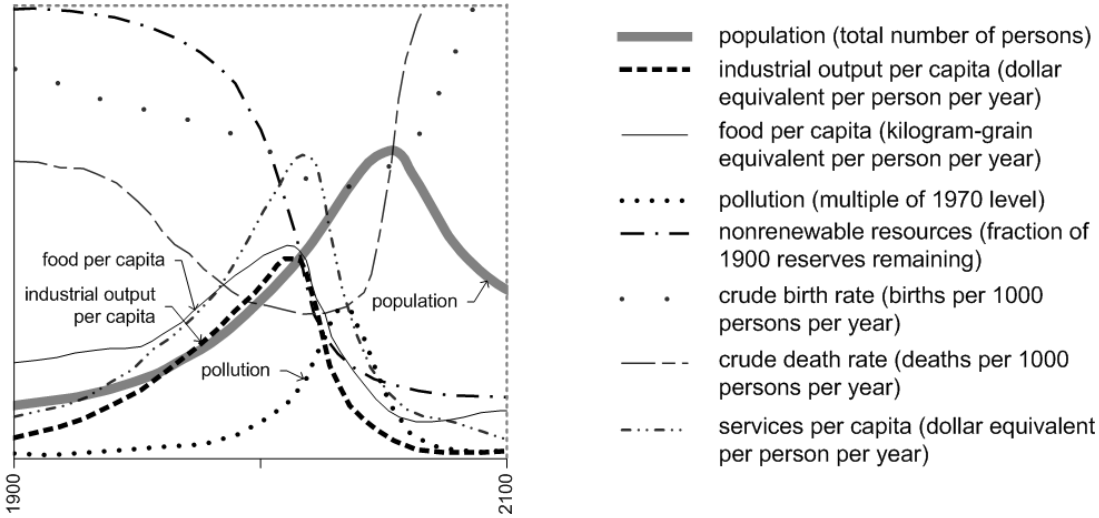


Figure 2: The 'World Model Standard Run' from *Limits to Growth*[41]

In many of the projected computer simulations, the assumption was made that other forms of life would continue to survive after we had caused ourselves to disappear. The report did not limit the consequences of their predictions to the Western world or even industrial societies. They claimed that the entire planet would ultimately be affected by the actions of the most developed countries.

The models used by the researchers for this study represented a new application for statistical computer modelling. Implicit in their working process was an understanding of the world as an integrated system. There was no indication that the effects of pollution, population and economic growth would be limited to a particular area. The effect of this report on the environmentalist discourse was significant. The emphasis on the global dimensions of the impending crisis had a unifying effect on the still relatively isolated groups searching for solutions to problems that were, as they were increasingly beginning to understand, beyond their immediate locality. The scientific basis for the analysis drew international support from the scientific community.

There was much debate, however, about the real accuracy and usefulness of the predictions. A collection of critical essays tellingly entitled *Models of Doom* was published the following year. The authors, from the Science Policy Research Unit at the University of

[41]Adapted from ibid., page 123.

Sussex, vigorously defend the idea that our current social institutions are capable of dealing with physical limits to growth. They argue that the MIT group underestimates the contribution of social and technical change. In short, they claim that as the impending catastrophe approaches the increasing general awareness provokes structural reorganisation in our society that lessens the consequences over time. With respect to technical change, the Sussex group seeks to demonstrate that "the inclusion of technical progress in the MIT model in sectors from which it is omitted has the effect of indefinitely postponing the catastrophes which the model otherwise predicts."[42] Technical progress – or the achievement of "greater output from the same inputs or reduced inputs, or the introduction of new products and processes" – they claim, is too great a factor to ignore and significantly alters the assessment of the model. Finally, they point out that such a generalised model of the inherently complex interactions in the world may have led the authors of *Limits to Growth* to poorly assess the results of their model. The Sussex group argues that the world models 'encourage self-delusion' in the following ways:

> • By giving the spurious appearance of precise knowledge of quantities and relationships which are unknown and in many cases unknowable.
> • By encouraging the neglect of factors which are difficult to quantify such as policy changes or value changes.
> • By stimulating gross over-simplification, because of the problem of aggregation and the comparative simplicity of our computers and mathematical techniques
> • By encouraging the tendency to treat some features of the model as rigid and immutable.
> • By making it extremely difficult for the non-numerate or those who do not have access to computers to rebut what are essentially tendentious and rather naive political assumptions.[43]

Besides their obvious concern for how effortlessly the MIT group moves from the questionable output of a highly abstract model to significant political conclusions, the authors of *Models of Doom* chastise the MIT group for contributing to a movement that, in the end, looks to uphold the status quo. Contributor K.L.R. Pavitt says that while the world model may have opened up discussion about the possibility of a future crisis, by failing to emphasise the conditional character of their conclusions, the authors of *Limits to Growth* have done little to counteract the fact that "people tend to believe predictions and their conclusions and policy recommendations tend to creep into the collective psyche."[44]

For their part, the authors of the *Limits to Growth* made no particular claim about the accuracy of their work, stating that they were well aware of the limited nature of their model and promised to continue the development of their project, but they insisted that the preliminary findings of their study were significant enough to be presented seriously to the world community regardless of their internal faults.

The debate raised by the world models, as exemplified by these two academic

---

[42]Cole, H.S.D. *et al*., eds. *Models of Doom: A Critique of the Limits to Growth.* New York: Universe Books. Page 10.

[43]Ibid., page 12.

[44]Ibid., page 156.

groups, has become a focus for the discourse. The tendency to deny the catastrophic nature of the problem as well as the persistence of the belief that humanity would be able to innovate a way around the problem became and remains a major part of the discourse surrounding the environmental crisis. Both sides of the argument have also linked the question of growth to the Western industrial way of life, firmly establishing concern for questions of technical and economic progress.

The International Community Effort

The events of the early nineteen seventies launched the environmental agenda as a world issue. The United Nations continued its role as facilitator at the international level and through a series of international conferences pushed for a common approach to the mounting ecological crisis. In 1987, the UN released a report entitled *Our Common Future* written by the World Commission on Environment and Development, which has since become known as the Brundtland Report after Harlem Gro Brundtland, the chair of the commission. The report was written by a multi-disciplinary group made up of representatives from both developed and developing countries. The task of the Commission was to present a comprehensive strategy on the environment for the global community.

The interdependent nature of our international relationships and their influence on the environment was noted in this report. Six main areas for concern are introduced in the report, each only to be realistically addressed by a concerted international effort:

- population growth
- food security
- ecological integrity and biological diversity
- energy
- industrial efficiency
- urban issues

The Commission's approach has a very positive tone:

> Our report, *Our Common Future*, is not a prediction of ever increasing environmental decay, poverty, and hardship in an ever more polluted world among ever decreasing stores. We see instead the possibility for a new era of economic growth, one that must be based on policies that sustain and expand the environmental resource base. And we believe such growth to be absolutely essential to relieve the great poverty that is deepening in much of the developing world.[45]

In this statement a partial resolution to the growth debate can be found. *Our Common Future* supports continued growth of the global economy – especially for developing countries. The report emphasises, however, that continued development must be able to avoid the destructive impact on the supporting natural environment that has been experienced by developed countries through the process of industrialisation. A concerted decrease in severity of the environmental impact of development is seen as critically

---

[45]World Commission on Environment and Development. *Our Common Future*. Toronto: Oxford University Press, 1987. Page 1.

important for the very much larger population of the developing world as they struggle to attain the same standard of living. What the Commission recommends, therefore, is sustainable economic development:

> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:
>
> - the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and
> - the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.
>
> Thus the goals of economic and social development must be defined in terms of sustainability in all countries . . . . interpretations will vary, but must share certain general features and must flow from a consensus on the basic concept of sustainable development and on a broad strategic framework for achieving it.[46]

Specific proposals are given for all of the major areas of concern identified in the report. *Our Common Future*, however, is primarily concerned with generating support for the concept of sustainable development in preparation for the next global conference. The 'strategic framework' is left for the United Nations Conference on the Environment and Development (UNCED) planned in Rio de Janeiro in 1992.

In 1992, in preparation for the UNCED, the Union of Concerned Scientists released the "World Scientists' Warning to Humanity" which was signed by over sixteen hundred scientists, including over half of all Nobel Prize winners. The document started this way:

> Human beings and the natural world are on a collision course. Human activities inflict harsh and often irreversible damage on the environment and on critical resources. If not checked, many of our current practices put at serious risk the future that we wish for human society and the plant and animal kingdoms, and may so alter the living world that it will be unable to sustain life in the manner that we know. Fundamental changes are urgent if we are to avoid the collision our present course will bring about.[47]

The document stated that the ecological crisis actually affects many distinct aspects of our environment. The widespread nature of the crisis prompted the authors to claim that "no more than one or a few decades remain" for us to implement major changes that would head off the impending disaster. They requested "a great change in our stewardship of the Earth . . . if vast human misery is to be avoided and our global home on this planet is not to be irretrievably mutilated." The strong language of this report went largely unheard and unheeded despite the fact that so many experts claimed that such a huge effort was needed in so little time.

---

[46]Ibid., page 43.

[47]From the introduction of *1992 World Scientists' Warning to Humanity* (www.ucsusa.org/ucs/about/page.cfm?pageID=1009)

The Earth Summit and Agenda 21

The United Nations Conference on the Environment and Development took place in June of 1992. Over 30 000 delegates attended the 10-day conference. They represented the governments, non-governmental organisations, businesses and religions of 178 countries. The official delegates in Rio de Janeiro were accompanied by 8749 media representatives ensuring that coverage of the events reached around the world.

An enormous amount of effort went into the preparation for the conference. Prior to UNCED, four Preparation Committee meetings were held in various locations around the world.[48] Most of the text of the major documents presented at the end of the conference was agreed upon during these sessions.[49] Between the PrepComs there were opportunities for draft versions of the work-in-progress to be reviewed by the many interested non-governmental organisations. Intense lobbying of the government participants on behalf of special interest groups resulted in a wide range of ideological perspectives being integrated into the discussions. Woman's groups, for example, were particularly influential and established a strong view of the consequences that the environmental crisis and the proposed solutions would have for women.[50]

Though the early PrepCom meetings provided ample opportunities for contributions from many different groups, the precise wording and scope of ideas to be included were questioned as the documents for the conference began to take shape.[51] The process by which these documents were reviewed and edited deserves some attention. A consensus was achieved through a process for 'bracketing' areas in the text that caused disagreement. The brackets were moved forward in the process so that they could be discussed again. If no agreement was reached on the issue then it was dropped entirely from the document. In this way, general agreement was reached in relatively short order on the 42-chapter *Agenda 21* that would form the backbone of the sustainable development theory.

Beyond this efficiency in reaching agreement on *Agenda 21*, the bracketing process had ideological and political consequences. The exclusion of initially disagreeable concepts essentially eliminated the more radical suggestions for change from the final draft of the documents. The conservative tendency excluded many of the original stakeholders and lead to a feeling of dissatisfaction in that the solutions proposed did not do all that they could have. Politically important participants in the conference were also allowed to modify the documents in exchange for their approval. Business leaders were thus able to work against proposed lifestyle changes that were perceived to have negative effects on commerce. The

---

[48]The 'PrepComs' were held in Kenya in August 1990, twice in Geneva in 1991, and in New York in 1992.

[49]The five major documents are the *Convention on Climate Change*, the *Convention on Biological Diversity*, the *Rio Declaration*, the *Statement of Forest Principles*, and *Agenda 21*. The full text of all of these documents is available online through the United Nations Environment Programme. (http://www.unep.org/)

[50]MacDonald, Mary. *Agendas for Sustainability: Environment and Development into the Twenty-First Century.* New York: Routledge, 1998. Page 13.

[51]Mary MacDonald, director of Policy and Research at the Earth Council, has suggested that since the documents were prepared in English and only later translated into other language, "the final documents may, in some way, reflect that some inputs were not possible due to a lack of timely translations" (*Ibid.*, page 7). This possibility may in part explain the perceived dominance of Western ideals in *Agenda 21*.

mere mention of transnational corporations was eliminated from several documents.[52] The Catholic Church gave support to the global plan of action only after direct references to contraceptives were removed.[53] The consequently weak language addressing the over-population is seen by those seeking radical change as another failure to confront the world's real problems directly.

What did emerge from the Earth Summit in Rio was a general consensus on the global policy towards environmental concerns. If the policy outlined in *Agenda 21* falls short of the action expected by many participants in the summit, it did at least draw the discussion together into a common front. Political scientist Maarten Hajer remarked that this global discourse is, in the sense that we can even talk about a common world strategy, something of a miracle given the number of agendas involved.[54]

Important Trends in the Modern Environmental Discourse

The preceding section has demonstrated several important changes in not only the way that we have come to define the environmental crisis but also the way we have come to understand our relationship to the environment. Perhaps most notable of these is the fact that the learning reported by ecologists has become fundamental to both perspectives. Rachel Carson's work made the damage to the environment understandable in terms of the normal functioning of biological systems. Her use of concepts such as 'ecosystem' allowed the idea that human activity somehow disrupts the natural order to be explained more precisely through the associated ideas of biological interconnectivity and interdependence. Healthy nature, as characterised by balanced ecosystems, was also contrasted to the unnatural and unbalanced processes created by humans. The perception that human processes lack this sense of balance is also a lasting legacy left by her work.

Carson's ecological approach addressed the fact that human beings, if considered most basically as biological beings are also part of interdependent global ecosystems. In the ecological perspective, we have the root of two environmentalist beliefs: one overtly pessimistic, and one cautiously optimistic. So common is the former, which is evident among people like Rachel Carson who truly understand our impact on the natural world as a kind of revulsion for the industrial and materialist aspects of our society, that environmentalism as a whole is often associated with a pessimistic outlook. The immediacy of the environmental crisis and the persistence with which even action with the best possible intentions continues to inflict damage to the natural world certainly contribute to a grim outlook for the future.

However, not too far below the surface in the work of Carson and other

---

[52]Author Adam Rogers comments that "the limited mention of TNCs in the UNCED documents was a reflection on the penetrating ability of business to affect government decision-making processes. It was also one of the most crucial components of environmental salvation that was left unsaid at UNCED." (Rogers, Adam. *The Earth Summit: A Planetary Reckoning* Los Angeles: Global View Press, 1993. Page 236)

[53]*Ibid.,* page 240.

[54]Hajer, Maarten A. *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*. Oxford: Clarendon Press, 1995. Page 46.

environmentalists with an understanding of ecology is the knowledge that, as biological entities, human beings are (or, at least, could be) compatible with the balanced natural processes that we see around us. This knowledge makes environmentalism decidedly optimistic at its core. Reflections on the great wisdom of life experience – of what it essentially is to be a thing that lives – which is embodied and constantly evoked by the web of life that lies all around us, cannot help but come to rest on the idea that human beings, if fundamentally constituted as the ecologists claim, are not only able to partake in but begin to comprehend the balance displayed by nature. The pessimism is not fundamental to the environmentalist movement, given these existential implications of Carson's contribution, but perhaps only symptomatic of the great frustration of being able to realise humanity's hidden potential at such an almost unbelievably slow rate.

The link between our industrial culture and the damage to the environment, which Carson confirmed in her work and gave scientific grounding to, was further developed by the events explained in the section on early environmental politics. With this indictment came the understanding that the environmental crisis was indeed coextensive with our expanding cultural boundaries not just with local situations. As aggressively as we were expanding markets and opening pathways for international trade, issues like acid precipitation made clear the international dimensions of the damage to the environment. The UN Conference on the Human Environment in Stockholm, which was initiated specifically to address the trans-border aspects of the environmental problem also uncovered, in the disagreement between the developed and the developing countries, a link to political and economic concerns. Through these associations, efforts to solve the problem of pollution became inextricably linked to the very powerful drive for social development exhibited by modern society. The global environmental crisis then is uniquely associated with the organisation, common determination, and technological capability of our modern culture.

The functional model of the world economy that was first employed by the *Limits to Growth* group incorporated a great confidence in our ability to analyse and respond to a problem that comes naturally to those with the kind of power that our society possesses. This is true, in the most obvious case, of the ambition of the world model itself as a conceptual construct assumed to have real predictive power. Less overtly the approach is based on an alternate optimism that technology is the answer. This is hidden partly by the foreboding predictions of failure but beneath these we find an unquestioned trust placed in our technological ability to secure understanding. The belief that an adequate comprehension of the environmental crisis is in fact possible, has only been strengthened by the advances made in information technology. This despite the fact, as Bjørn Lomborg is fond of pointing out, that every prediction of the future collapse of our society has been proven wrong by time. This string of virtual failures – virtual because many disagree with Lomborg's assessment – has not caused much doubt in our ability to actually understand the problem. This broad statistical approach, it should be noticed, is directly contrary to the intense personal experience that founded Carson’s criticisms.

In the modern environmentalist discourse then, two broad approaches towards understanding the environmental crisis are evident. The first is the ecological perspective, which is exemplified by Rachel Carson’s work and has a stronger connection to the Romantic Naturalists and the conservation movement. The second is an economic approach more common to the political discourse that tends to focus on the social consequences. Since the Earth Summit in Rio the ideological divide between these two approaches has been held in balance by the agreement reached by the concept of sustainable development.

What remains to be determined is whether the process for change that the environmentalist discourse has made has, in fact, significantly altered the balance between our society and the natural world in a way that can preserve the state of life on this planet; or has, at the least, begun to provide an alternate relationship that accomplishes the same end by other means. For this, a more complete understanding of the hard fought position of consensus that was achieved by the UN Conference on the Environment and Development and the ensuing and increasingly obvious indicators of underlying confusion, will begin the path towards an answer.

The Global Compromise

Introduction

Through the series of international conferences sponsored by the United Nations the understanding of the environmental crisis has grown quite broad in our general awareness. The widespread pollution caused by our industrial way of life, coupled with the increasing density of our population throughout the world, has made the destructive effect of our society a truly global concern. Our perspective relative to the world has changed. No longer do we look beyond the edges of our civilization to unexplored areas, untouched by human life. The boundaries of our activities have merged - through cultural and economic exchange. Sustainable development is intended to be a world solution and, therefore, must attempt to address the specific forms of the environmental crisis experienced by all countries and all peoples.

Since the Stockholm Conference on the Human Environment, the unique plight of the so-called developing countries had been recognised and the link between poverty and environmental degradation firmly established. *Agenda 21* begins with this comment on the critical need to address the plight of developing countries:

> Humanity stands at a defining moment in history. We are confronted with a perpetuation of disparities between and within nations, a worsening of poverty, hunger, ill health and illiteracy, and the continuing deterioration of the ecosystems on which we depend for our well-being. However, integration of environment and development concerns and greater attention to them will lead to the fulfilment of basic needs, improved living standards for all, better protected and managed ecosystems and a safer, more prosperous future. No nation can achieve this on its own; but together we can - in a global partnership for sustainable development.[55]

Great hope was placed on the Earth Summit to address the environmental crisis and the "perpetuation of disparities between and within nations" through a united vision. The outcome of this conference was not as ground-breaking as expected. The first principle of the Rio Declaration, which summarises the accomplishments of the conference, reads as follows: "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature."[56] Here we find a reaffirmation of the central importance of human concerns. The idea of balance between human culture and the environment with a necessary respect for processes that are not

---

[55]From *Agenda 21*, Preamble 1.1 (http://www.un.org/esa/sustdev/documents/agenda21/english/agenda21toc.htm)

[56]From the *Rio Declaration on Environment and Development*, (www.unep.org/Documents/Default.asp?DocumentID=78&ArticleID=1163)

directly controlled by or for humans is a secondary objective.

The second principle affirms the right of each country to "exploit their own resources pursuant to their own environmental and developmental policies" and places responsibility for this action firmly in the hands of each state. These two principles together can be read as the basis for the 'right to development,' creating fears that nothing more has been accomplished than to provide justification for the world to continue much the way that it has.[57] However, the appearance of the argument for development in the environmentalist agenda has an explanation in the political division of the globe into countries of the North and South.

International Development and the North and South Divide

The root of the North and South division in international politics is closely connected to the concept of *international development*. The popular use of the term in international and environmental politics has taken on a more particular meaning than the common dictionary definition.[58] For sustainable development theory, the choice to use the term development has made a conceptual bridge between past international policy and the new changes that environmentalists suggest but also brings with it linkages to a series of assumptions already deeply embedded in international politics.

Environmentalist philosopher Wolfgang Sachs[59] traces the use of the term development to a set of ideas introduced by American President Harry Truman in 1949. In his inauguration speech Truman made economic development of the 'underdeveloped' world the fourth point of his new program for global stability and prosperity:

> Fourth, we must embark on a bold new program for making the benefits of our scientific advances and industrial progress available for the improvement and growth of underdeveloped areas. More than half of the world are living in conditions approaching misery. Their food is inadequate. They are victims of disease. Their economic life is primitive and stagnant. Their poverty is a handicap and a threat both to them and more prosperous areas. . . . Our aims should be to help the free peoples of the world, through their own efforts, to produce more food, more clothing, more materials for housing, and more mechanical power to lighten their burdens. . . . [The international effort] must be

---

[57]The term 'development' in international politics refers to a specific policy initiated by Western countries after the second World War. Since the assumptions that underlie this policy are discussed in detail on page 30 of this thesis, it is enough to notice here that in political discussions about sustainable development from the 1960s to the 1990s, economic associations accompanying the term 'development' create a conceptual divergence from the calls for radical social change that had previously been the major influence in environmentalist thought.

[58]The Oxford English Dictionary lists several definitions for 'development': "A gradual unfolding, a bringing into fuller view; . . . Evolution or bringing out from a latent or elementary condition; . . . The bringing out of the latent capabilities (of anything); . . . the fuller expansion (of any principle or activity); . . . The act or process of developing . . . a mine, site, estate, property, or the like; also, a developed tract of land. " (OED online edition)

[59]Wolfgang Sachs is a senior reseacher at the Wuppertal Institute for Climate, Environment and Energy. He is the author and editor of many books on global politics and the environment including the influential *Development Dictionary: A Guide to Knowledge as Power.*

> a worldwide effort for the achievement of peace, plenty, and freedom. With the cooperation of business, private capital, agriculture, and labor in this country, this program can greatly increase the industrial activity in other nations and can raise substantially their standards of living.[60]

The rewards for the world were also outlined in Truman's address:

> All countries, including our own, will greatly benefit from a constructive program for the better use of the world's human and natural resources. Experience shows that our commerce with other countries expands as they progress industrially and economically. . . . Greater production is the key to prosperity and peace. And the key to greater production is a wider and more vigorous application of modern scientific and technical knowledge. Only by helping the least fortunate of its members to help themselves can the human family achieve the decent, satisfying life that is the right of all people.[61]

Sachs claims that the distinction made by the American president between countries of the 'developed' world and those of the 'underdeveloped' world resulted in a broad reconceptualisation of the world according to the ideals of industrialised nations. The distinction has ever since affected our understanding of relationships between countries and served as the foundation for a new international policy. The older British view of colonial relations, which had always maintained a separation between cultural progress and economic exploitation, was collapsed in Truman's address into a single mandate of 'economic development.'[62] It is the identification of economic development with cultural change, Sachs argues, which reflects a belief in the superiority of an advanced industrial society and carries with it significant cultural implications for underdeveloped countries:

> Truman's imperative to develop meant that societies of the Third World were no longer seen as diverse and incomparable possibilities of human living arrangements but were rather placed on a single 'progressive track', judged more or less advanced according to the criteria of the Western industrial nations.[63]

All other cultural standards by which underdeveloped societies might be judged - including an understanding of value in non-economic terms - are thereby discarded.

Sachs also points out that the conceptual base for the division between underdeveloped and developed countries rests on a questionable definition of poverty. He finds that since Truman's speech, the understanding of the living conditions in underdeveloped countries has been clouded by the tendency to emphasise economic measures. Social indicators, such as the average family income and basic levels of nutrition, blur the boundary between people living a life of sufficiency–that is, living a simple, healthy life within their means–and one of destitution. He gives an example of a traditional Mexican

---

[60]Inauguration Address of President Truman January 20, 1949. (www.multied.com/documents/Truman.html)

[61]Ibid.

[62]Sachs, Wolfgang. *Planet Dialectics: Explorations in Environment and Development.* Fernwood Publishing, Halifax: 1999. Page 4.

[63]Ibid., page 4.

village:

> . . . the private accumulation of wealth results in social ostracism; prestige is gained precisely by spending even small profits on good deeds for the community. Here is a way of life maintained by a culture that recognizes and cultivates a state of sufficiency; it turns into demeaning 'poverty' only when pressurized by an accumulating society.[64]

Members of this community, Sachs claims, derive continual benefit from the generosity of others and while their individual wealth may not be great there is level of social welfare that is not easy to measure by the standards of developed countries.

Despite the conceptual problems that Sachs identifies, the need for economic development has become firmly entrenched as the context for international policy. As a result, the world has been firmly divided according to geography and relative social sophistication. The industrialised countries, which are primarily located in North America and Western Europe are called the North and most of the rest of the world belongs the underdeveloped South.[65] Over the past 50 years, the world has experienced development policy as a program of social restructuring for underdeveloped countries and increased economic activity for the world in general.

While rapid industrialisation has taken place to transform Southern societies into productive economies modelled after the industrial North, the development program has failed to create the prosperity and security that Truman laid out as objectives. In many parts of the world scarcity of resources has increased and social stability has weakened in close proportion to the adoption of Western practices. Since the Stockholm conference, the increasing strain on the environment has been linked to the spread of poverty in countries of the developing South. In environmental policy, different roles and ideals for both the North and the South have become a fundamental part of sustainable development.

North and South Positions Explained

The development path for Northern countries is based on solidifying our economic strength while increasing the efficiency of our society's use of energy and material resources. We will become more efficient but without a cost to our material wealth and security. A reliance on technology and advanced knowledge is key to this solution. Our industrial society can become relatively 'light' in the sense that we will use less energy and be able, ultimately, to preserve some part of our natural resources for the future. Our task then is to establish environmentally-friendly alternates for current technology while minimising compromises made to our lifestyles of relative luxury.

The position of the South is quite different. The assumption of the development agenda is that the position of developing countries in global politics will continue to be weak until they industrialize to the level of the West. The South is also pursuing the development

---

[64]Ibid., page 11.

[65]The Northern countries are often associated with the Group of 8 (the G8, which include Canada, France, Germany, Italy, Japan, Russia, the United Kingdom and the United States) and 132 nations of the Southern countries, including Brazil, China and India, are represented by the G77 coalition. The G77 was formed to counter the greater economic strength of the G8 in global politics.

of very basic infrastructure that is being built to support a growing population. Beyond this however, there is the ambition to achieve for their citizens the level of material wealth and security that is available in the Northern countries. From experience in the North, the process of industrial development is energy intensive especially if the most direct route is taken. Since they are dealing not with a maintenance of a luxurious standard of living but, in many cases, the very survival of their population, countries in the South see the quickest possible path as the necessary one.

The North is not a bystander in this process either. For more than humanitarian reasons, an increased level of development around the world is desirable to countries of the North. Developed societies have enjoyed political and economic stability. The increasingly obvious global nature of our economic structures has meant that instability in one part of the world inevitably affects all others. For the Northern countries who have historically depended on the developing nations for resources, stability is a must. Beyond this however, there is a need to open new markets to continue the economic growth that we are accustomed to. The prospect of being able to extend material wealth to the other four fifths of the world's population is more than attractive because it would support growth in Northern countries for an indefinite period of time. In this objective, the North and the South are on the same page.

There are two major problems to this shared dream: the process and the result. The process favoured by the South for achieving 'developed' status is the direct one. For the Northern countries this choice is not so clear. In the West, the Industrial Revolution was characterized by enormous consumption of energy and resources with little concern for the consequences for the environment as one emerging nation strove to surpass all others. This race took place in a world that was thought to have no limits. The discovery and subsequent exploitation of the New World provided justification for this myth. We have not quite recovered from the blindness that this race for power brought but we are now beginning to see the damage that has been wrought. The global environment, as has been previously mentioned, appears more and more like a finite system.

The agenda of resource and energy conservation that is currently prescribed for Northern countries seems woefully inadequate when considered next to the reality of a second industrial revolution in the South. It is doubtful that our world already showing signs of severe environmental strain could support the environmental impact at double the speed and four times the magnitude that it undertook over the last three hundred years. The truth of this is apparent even if only the availability of resources and the size of population are considered, without any particular agenda for preservation of other forms of life.

By almost any calculation, Northern countries are responsible for the vast majority of the damage to the environment. We have done this with less than a fifth of the world's population. Although we have reduced the toxicity of, for example, coolants used in refrigerators, the current technology would present a dangerous problem if it was used by the other four fifths of the world’s population. The maintenance energy and disposal costs are difficult for Northern societies to bear as it is. The economic growth of Northern economies has come to depend on the consumption of material goods and therefore is characterized by enormous amounts of waste. Because the 'best' efforts of the Northern countries to be more efficient and ensure conservation have resulted in only a marginal reduction in damage to the living environment, it must at least be said that much greater effort is needed to address the same problems at the scale now possible in the developing world.

In general, there is reason to help developing countries make the transition to a rich but less energy-intensive economy as quickly as possible. The leadership role of the

developed countries in this task is clearly implied by the sustainable development agenda. The North can offer the South a different path to development based on our experience and advanced technology but certainly not through an example of how it should be used. For the North, the approach to the crisis remains one of measured compromise of a lifestyle that has been built on ruthless exploitation of resources. For the South, the same ruthlessness means an immediate loss of life through famine, desertification and armed conflict. In this sense, limits to progress imposed by the North are more than unfair. Both of these points of view are well understood and sustainable development is a compromise between the two agendas.

Implications of the Global Compromise

As a global strategy, sustainable development looks to hasten the industrialization of Southern countries and at the same time to minimize the impact of this process on the environment. In this formulation, the interests of both the North and the South coincide. The North plays the leadership role by sharing information, technology and capital. Organisations like the United Nations, the International Monetary Fund and the World Trade Organisation are key in facilitating the flow of intellectual resources into the developing world. The rapid industrialization of the South creates new markets for specialized technologies and ultimately consumer products, which are exploited by the Northern economies. Through these channels, the South gains access to technology that will speed the social transformation. Having these resources, the Southern countries are thought to be capable of addressing the problem of poverty and subsequently able to lessen the impact on the environment. But the effects of this activity is not as seamless as supposed.

The strategy does not give the South independence in the world's political and economic systems. The reality is that the developing countries allow practices that would not be allowed in the developed world. The result is two tiers of environmental responsibility that allow for easy movement of companies from one to the other. When a company is forced to move its polluting operations out of a Western country, it can likely find a home in a developing country that is forced to tolerate its environmentally destructive practices. A 'two world' split creates ideal conditions for commercial exploitation. The companies can use existing technologies that are no longer in use in the North as well as having immediate access to new consumer markets as they develop. This kind of activity often goes hand-in-hand with political manoeuvres that strengthen Northern economies in return for the needed investment in the South to spur development. The Canadian government's promotion of asbestos in South American countries is an example of the attempt to open new markets for goods that are essentially banned in the home country.

Throughout the many chapters of Agenda 21 there is a common conceptual framework that is more or less synonymous with what is now referred to as sustainable thinking or sustainability. Political scientist Maarten Hajer, following others, refers to the underlying framework as 'ecological modernisation' and defines it in this way:

> In the most general terms, ecological modernization can be defined as the discourse that recognizes the structural character of the environmental problematique but none the less assumes that existing political, economic and social institutions can internalize the care for the environment.[66]

To the ecologically-minded thinker, this definition rightfully seems paradoxical. Internalising care for the environment is identified as a central issue but what 'caring' for the environment entails is not clear. The confidence with which ecological modernisation looks away from the structural issues does not seem to be justified. Sustainable development asks for a change in the scope of our decision-making - considering the needs of future generations along side those of the current population. Determining these 'needs' must come with an understanding of what level of use the environment will bear and so a balance of our needs against the ability of the environment to support them is an important compromise implied by the idea of a sustainable society. If care for the environment is interpreted as acting to ensure that the environment can support human needs and thereby demonstrating a new sense of value in the environment, then ecological modernisation needs to offer a method of assessing our needs and the requirements of the natural world, as well as a way of planning for social change to accommodate this 'ecological' reality.

Planning of this type is inherently more complicated than our current decision making process which is focussed largely on short term measures. In order to assess global impact, more information is needed about the world itself and the society and values of other groups of people. The long term implications of our choices are also not clear without more knowledge of long term effects. As an example, a relevant issue such as short-term weather prediction is firmly within the grasp of current technology: for the Olympic Games in Atlanta in 1996, computer models of the local climate were able to accurately predict rainfall within a span of several minutes, 24 hours in advance. To do this required the most sophisticated computer available at the time. Work has continued on this task with the attempt to develop a computer some 100 times as powerful. The expected result of this new technology will only be to double or triple the advance notice.[67] For an indicative understanding of global climate change such precision is thankfully not required but the required time frame, however, is far longer.

Aside from actively encouraging the support of scientists of all disciplines, sustainable development theory does recognise the importance of creating a broader base for understanding. Although the lack of knowledge available has the potential to be a

---

[66]Hajer, Maarten A. *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*. Oxford: Clarendon Press, 1995. Page 25.

[67]Personal conversation in June 2002 with Dr. William Pulleyblank, director of IBM's Deep Computing Institute. For more a detailed description of IBM's research into climate modelling, which includes images and applications, see: http://www.research.ibm.com/weather/.

debilitating problem for long term and global thinking, sustainable development appeals to the *precautionary principle* to inform the direction of relatively uninformed decisions. The principle states that a lack of scientific certainty will not be allowed as a reason against preventative action on environmental issues. The intent, of course, is that what scientists have good reason to believe are the causes of problems can be used by decision makers in an effort to make an immediate difference.[68] The justification for the precautionary principle is clear when the risks to human health and safety are great. The difficulty with the principle in practice is that the way that the actual risk is determined is questionable in light of the limited knowledge that we have. Thus the same problem that was sought to be avoided by the principle - the need to entertain doubts and delay action when sufficient proof is unavailable - resurfaces in the assessment of risk.[69] Another complication is that the profit motive, which is perhaps the more common motivator for change in our society, encourages risk taking even where the consequences may be extreme, as long as the amount of profit is deemed to be enough. This tendency allows situations where environmental damage is a possibility to still be classified as an opportunity for profit as long as the scientific evidence is inconclusive. As the precautionary principle is designed to promote caution in exactly these situations, the profit motive and the precautionary principle are directly at odds.[70]

Researcher Mary MacDonald summarises the core principles and objectives of *Agenda 21* that seem also to be shared by other initiatives for addressing the environmental crisis:

> Principles guiding environment and development activities for which there is broad agreement include considering the needs of future generations, adopting the 'precautionary principle' (that is, erring on the side of caution when the effect on the environment is unknown), increasing participation in decision-making, respecting the knowledge of indigenous peoples and co-operating internationally to achieve a more sustainable existence.[71]

Beyond these core values there is no precise description of sustainability or sustainable thinking and how it may translate into effective action. As exhaustive as *Agenda 21* may seem given its large volume and substantial list of contributors, the proposal leaves much more to be determined. To enact the recommendations that are made by the Agenda, these principles will have to be translated and applied to the similar but importantly different problems faced in all parts of the world.

The Condensed Contents of Agenda 21

---

[68]This is very much the same way of thinking as the arguments behind anti-smoking legislation prior to having established the physical link between cigarette smoke and disease in humans. The legislation was implemented in the 1990s but the connection between habit and health was fairly certain by the 1960s.

[69]Some of the typical arguments on this point are presented and discussed in part 3 of this thesis.

[70]Sustainability theorists such as Paul Hawken (*Natural Capitalism*, *The Ecology of Commerce*) are at great pains to show that this is not necessarily the case; that given time, we will be able to devise solutions that set the profit motive in action in service of the precautionary principle.

[71]MacDonald, Mary. *Agendas for Sustainability: Environment and Development into the Twenty-First Century.* New York: Routledge, 1998. Page 105.

The 40 chapters of Agenda 21 present the world's governments with a plan of action to implement sustainable development. They are divided into four sections:

I. *Social and Economic Dimensions*
   Section one addresses social issues such as population growth, poverty, human health, and community planning; as well as economic concerns including international trade and patterns of consumption.

II. *Conservation and Management of Resources for Development*
   Specific approaches are outlined for reducing atmospheric pollution conserving drinking water, managing fragile ecosystems, preventing deforestation, drought and desertification, and conserving biodiversity. Areas of human impact on the environment are addressed, including: agriculture, biotechnology, use of oceans, toxic chemicals, hazardous and radioactive wastes, and the disposal of refuse and sewage.

III. *Strengthening the Role of Major Groups*
   Stakeholder groups are identified and the specific needs and abilities of each are discussed. The groups are: women, youth, indigenous peoples, non-governmental organisations, local authorities, trade unions, business, science, and farmers.

IV. *Means of Implementation*
   Key international political and financial mechanisms are addressed in the final section. Of particular note, are comments on the transfer of technology from the North to the South, the continued cooperation of the global scientific community, and an effort to raise the general public awareness and interest in sustainable development issues.

Each chapter of the Agenda lists a basis for action, objectives and an evaluation of the means for implementation. The latter attaches specific cost to every recommended activity. In total the proposed budget for the sustainable development effort is $600 billion per year - or approximately 7 percent of the world's GNP.[72]

Understanding Sustainable Development

Since *Agenda 21* does not present a goal in the form of a model for human societies and since sustainable development does not provide specific instructions for resolving environmental problems, a clear understanding of the guiding principles will be essential to their effective application. Part of the success of the UNCED conference in Rio de Janeiro was the generally confident feeling that a shared vision had been achieved in the creation of sustainable development and *Agenda 21*. In concluding a 1998 review of many agendas for social change, researcher Mary MacDonald remarks that "*Agenda 21* stands alone as an agenda that still has relevance to many actors," this due largely to the consensus formed at UNCED that it represents and despite continuing difficulty in implementing the recommendations that it contains.[73]

A UK researcher John Pezzey, has undertaken a study of sustainable development that shows the opposite of the commonly held view that a global consensus has been

---

[72]For the more than 500 page unabridged version of Agenda 21, see the UN's internet service: www.un.org/esa/sustdev/documents/agenda21/english/agenda21toc.htm

[73]MacDonald, Mary. *Agendas for Sustainability: Environment and Development into the Twenty-First Century*. New York: Routledge, 1998. Pages 100-104.

secured. In a short report entitled "Definitions of Sustainability" he reviews more than sixty policy documents and claims "that there is not general agreement on exactly what sustainable development means."[74] While he feels that the 'fuzziness' of the perceived consensus is politically useful in that it has hastened the attempts to incorporate the agenda into policy, it has a decidedly negative effect on our understanding of the unresolved "political, philosophical and technical issues." He quotes author Timothy O'Riordan who worries that "it may only be a matter of time before the metaphor of sustainability becomes so abused as to become meaningless."[75] O'Riordan made that statement 14 years ago, and no more than a decade after the term first came into general use. For Pezzey, the room for confusion and misinterpretation within the concept will almost inevitably lead to misapplication.

Pezzey gives three points that apply to most definitions:

1. They are all long term concepts that include a consideration for the future even if the specific form it takes varies.
2. They involve international justice based on the understanding that all peoples are affected by the ecological crisis but without a clear idea of what the ecological crisis is.
3. They are typically phrased mathematically, using what he refers to as 'neo-classical economic models' which are therefore constrained by their abstract nature.[76]

In these three points we see a culmination of the trends that we have been following through the history of the modern environmental discourse, namely: the increased perception of the crisis as an international problem, that will not be solved by local or short-term solutions; and the increased reliance on sophisticated rational models of the world that seem to best represent the economic and political structures that are involved in the crisis. Also evident is the trend towards a general editing of any other potentially valid forms that solutions that may take place, and a narrower and narrower definition of the problem in economic terms.

To effectively implement sustainable development and achieve the global cooperation that is required, a shared understanding of the political, philosophical and technical issues that Pezzey identifies would seem to be needed. If the current state of the environmentalist discourse suffers from a lack of clarity in this respect, then efforts must be made to open avenues by which a more precise understanding of the ecological crisis might be spread and through which the framework for understanding the crisis offered by sustainable development might be subject to a critical attempt to refine and develop our admittedly fragmentary grasp of the environmental problem that we are faced with. We might start by recovering a sense of what the term sustainability means.

---

[74]Pezzey, John C.V. *Definitions of Sustainability*: *UK CEED Discussion Paper No. 9.* London: UK Centre for Economic and Environmental Development, 1989.

[75]O'Riordan, Timothy. "The Politics of Sustainability," in Turner, R.K., ed., *Sustainable Environmental Management: Principles and Practice.* London: Belhaven Press, 1988. Page 30.

[76]The global form of these economic models, as we have discussed, were made popular by the MIT researchers who contributed to *Limits to Growth.*

Sustainability, in the global context, means that life is maintained continuously over time. This means that there is no net change in the conditions of the world that support life. Based on what we know of the natural world, the phrase 'sustainable society' implies two explicit requirements. First, our society must be internally structured to preserve itself in some acceptable form. Values generated on our own terms are necessary to ensure that this is possible. Second, since our survival depends on nature and the world around us, our society must not consume non-renewable resources and not damage the sources of the renewable ones. We must recognise that nature is at least partly and perhaps entirely outside of our control. This would seem to indicate the necessity of a sensitive and responsive attitude on the part of our society and would suggest that the way our society changes would be, in part, based on values set according to our understanding of the independent functioning of the natural world. Since both of these requirements are in their own way necessary to the goal of a indefinitely sustainable society, a compromise of either is not a sustainable approach.

Given the intensely political meaning of the term 'development,' it seems that the sustainable development agenda has difficultly separating a concept of social change in light of environmental limitations from one that is based on the pursuit of economic and technical progress. However, the consequences of not understanding and failing to respect the connections between our culture and the natural world make it obvious that a development of our society that incorporates a different sense of the value of nature is required. It is not clear that a single-minded focus on economics is the appropriate framework for making this happen. The needs of society must be recognised but balanced, both by a sensitivity to the requirements of natural systems and by the consideration of future generations of life. The image of a global community of societies progressively unfolding cultural, technological and economic possibilities, and maintaining a state of balance with the natural world through greater understanding and care, is closer to a model of what a sustainable society might be.

In this section, the review of the political and scientific discourse on the environment has revealed that although there is an apparent consensus on the existence of a global environmental crisis, and on sustainable development the solution, critical unknowns exist. With regard to the natural world, both the extent of our impact on the environment and the length of time the world can sustain our society remain unclear. For our global community, an equitable balance between human societies has not been reached and an understanding of how to secure the resources needed by future generations has barely been addressed. While a working definition of sustainability that adequately addresses the political, philosophical and technical issues raised by the environmentalist discourse remains elusive, the need to address the environmental crisis remains unchanged. These unresolved problems are carried forward into the following section as a critical perspective from which to examine practical solutions that claim some affiliation to sustainable development. Given the uncertainty found here at the theoretical level, the question of what might constitute an effective response to the environmental crisis remains a paramount concern.

2: Towards a Clearer Understanding

Section Summary

The second section is about proposed solutions that fall under the sustainable development model. A series of solutions is examined starting with the very typical focus on increasing energy and resource efficiency to reduce the overall impact on the environment. This approach is related to an understanding of the environmental crisis as being caused by various technical inefficiencies in society and focusses on technology and scientific development as the way to address these inefficiencies. Factor four, variant of this way of thinking, is discussed. Leading American proponent Amory Lovins criticises localised increases in efficiency for being unable to effect large-scale change. He identifies much greater results if system-wide efficiencies are considered - a task requiring an interdisciplinary approach.

Next, architect William McDonough and chemist Michael Braungart attack the idea of efficiency itself. McDonough and Braungart point out that the 'eco-efficiency' strategy inevitably makes the assumption that some degree of damage to the environment is acceptable. They claim, however, that our society does not have enough information to assess the validity of this assumption. They outline a different approach where an intentional separation is enforced between 'technical' products of industrial processes not meant for exposure to the larger environment and 'biological' products that are carefully designed to interact with natural processes. Conceptually this is a fundamentally different approach, relying on innovative technology to gradually but radically transform society.

The effectiveness of technological innovation as a source for social change is questioned in light of the limited amount of knowledge that we have about the environment. Where McDonough and Braungart's approach maintains that a significant alteration of our society must occur, poor comprehension of the complexity that characterises both our society and the natural world makes technological change alone a doubtful solution. It is noticed that in determining a solution, the values which underlie the social dimensions of technology are more directly linked to the effectiveness of any technological solution. The work of all of the authors, in fact, makes reference to an environmentalist ethic representing a set of common set of values that must attain widespread acceptance to ensure that practical solutions are able to help guide social change.

The section concludes that this ethical position holds the key to an effective and sustainable solution and therefore warrants further examination.

Towards a Clearer Understanding

Introduction

In the first section, the description of the events leading up to the formulation of a global strategy on environmental issues presented an understanding of how the many different and sometimes incompatible points of view were solidified into a single recognisable vision. The vision, which calls for a sustainable society, is an umbrella solution; that is, it sets out a global direction that must be resolved into specific proposals at the local level. Success of *Agenda 21* and the sustainable development concept as a workable strategy therefore depends on translation into regional solutions suited to local politics, culture and climate, etc. The success of these local interpretations, in turn, will rely on a clear identity between global and local goals, on communication and cooperation between groups and on our ability to read and respond to signs of success. This last point relates strongly to our ability to judge the effectiveness and appropriateness of the global strategy; criteria that must be taken as an essential part of a successful resolution to the environmental crisis.

As has been noticed in the previous section, the sense of global unity intended for *Agenda 21* is contradicted by the lack of agreement regarding such fundamental issues as the interpretation of what sustainable development is and the relative priority of environmental and economic issues. But given the ideological differences between contributors and about the process that was used to exclude subjects of disagreement from the final draft, the reappearance of disagreement should not be surprising.[77] Our current situation then, which is characterised by confusion about means and ends, works against the communication required for concerted action. Beyond this, the possibility looms that action is unknowingly misdirected to exacerbate the very problem it is trying to solve. The pressure for action remains the same: the consequences of inaction or ineffective action may be very great for society. It is important, therefore, to be sure that the problem has been accurately defined, that widespread cooperation can be established and that the success of our actions can be measured. All of these requirements apply to the local level but they are, because of the global nature of the crisis, particularly important from a global perspective.

Agenda 21 is itself partly to blame for the confusion. The Agenda does not present a concrete goal or a detailed path: the idea of a sustainable society is poorly defined and certainly does not qualify as an image of the future that could capture the global imagination. The lack of clarity here is not for lack of ideas or lack of motivation. Quite

---

[77]On the other hand, responses to the environmental crisis that begin as grass roots movements are more often successful because they are able to secure personal commitment to their proposals. This commitment is negotiated because the movements rarely begin in a position of social or political power. Without the need for negotiation, global or even national solutions developed by governments are generally unable to mesh seamlessly with the local needs and are therefore rarely able to achieve the same degree of success.

simply, the environmental crisis is so complicated, its root problems so varied, that a clear expression of its solution may be too much to ask. What it does present is sustainable development – not a goal or ideal but a process for improvement. Our concern, therefore, in establishing the viability of the global solution lies in determining whether or not the economic outlook upon which sustainable development is based can, in practice, address the criteria for success that we have outlined above.

Many different kinds of strategies for change were suggested for *Agenda 21* and some even remain within the document in diminished form. Economic growth, however, has achieved a position of priority such that sustainable development has become identified in the minds of many with sustained economic development. Economic development, taken alone, is arguably only a means to an end but there are some important reasons why it has been given such direct relevance to the solution to the environmental crisis. The ability of the economic system to measure progress and quantify success is highly reassuring when compared to the absence of specific direction in *Agenda 21*. Although many would maintain that economic development is not crucial for a solution (it being identified strongly with the cause of the ecological crisis), few would disagree that it in some way must play a part.[78] In this there is enough common ground that global suggestions for the idea of development to find its way into local solutions with relative ease. What makes this possible is the increasingly unified global economy where the default language of international decision-making is, without question, economic in outlook. The tendency to view our relationship to the environment in economic terms, of course, accompanies the social dominance of economic issues. Even those that disagree with this thinking as an appropriate component of our worldview do not disagree that everyone understands this measure. Since the economic outlook transcends national and cultural boundaries, it can attain the group motivation required for an effective solution. This being the case, many people who believe that other ways of understanding the world will ultimately be more successful are willing to set disagreement aside to pursue a conceptual structure that promises immediate and measurable results. The pressure to move forward is so powerful that searching for another solution seems irrational and a waste of time.

As has been said, we must reserve one question in our evaluation: can the economic outlook clearly respond to the essence of the problem in a way that will lead us to a lasting solution? This is not a question about effectiveness - it is a question about appropriateness. This criticism seems justified if only for the reason that our society's *de facto* solution calls for action that so closely resembles our historical push for development. Has our agenda really changed to accommodate the environmental crisis?

There are other reasons that must provoke our questioning of the appropriateness of the sustainable development solution. We know that the causes of the environmental crisis are complicated and our knowledge of them weak. Can the economic outlook assure us that we are solving the right problem? Of great importance to our ability to solve the environmental crisis is our ability to understand the environment. Can sustainable development and the economic outlook provide the framework for this understanding? We know that some change in our relationship with the environment will be required to solve the problem. Can we incorporate a sense of value for the environment into our society that will be sufficient to protect it? For the survival of life as we know it, the restitution of a healthy

---

[78]We will see in the chapters that follow that proposed solutions are phrased in such a way that they are compatible with or at least understandable to the goal of economic development.

relationship with the environment is paramount. Can we form a solution that will be lasting?

To answer these questions we will look at how the economic argument is used to organise our response to the central issues of resource use and pollution. Both of these are generally agreed to be fundamental problems because they contribute to the major indicators of global environmental damage such as climate change, loss of habitat and loss of biodiversity.[79] Both are associated with the operation of industrial society and are therefore closely linked to the agenda of economic development in both Northern and Southern countries.[80] These issues also depend, it would seem, on the way that we view the environment around us and understand our relationship to it. They represent major points through which our industrial society connects with the natural world.[81] For the proposed solutions to these two problems, we will look at the measures of success and determine if they are adequate - that is, if they can provide us with an accurate determination of whether or not economic development is an effective strategy to solving the environmental crisis.

Limits to Resource Efficiency

Since pollution and over-use of resources are linked directly to our industrial process, it seems natural to look within the process itself to solve the problem. In this analysis, we can look at the efficiency of the process by asking, for example, if we can use less energy or make less pollution, or we can examine the orientation of the process, by asking if we are making the right products for appropriate lifestyles. Examining efficiency is easier. Increases in efficiency often yield the fastest and cheapest results with the least amount of effort. The familiar structure of our society is a large part of the reason for this: it creates a certain sort of social inertia that controls our response to a problem. The structure of our society also reflects a conceptual framework that automatically contributes a context to new problems. This framework, which helped us design the process, is familiar and focussed. We have specialists who are already knowledgeable and are working with the problem. We have, in addition, the physical elements of the process in place to make the changes. The specialisation of our society is the key to our ability to make continual improvements in efficiency.

There are, of course, natural limits to the potential for steady increases in efficiency. In many cases the limited capacity of our technology is related to the operations of the natural world and the knowledge that we have of them. The energy available to us from wind power, for example, is measured against the Betz limit of 59.2%. The Betz limit embodies the fact that some percentage of the wind power must be used to move the given volume of air past the wind turbine in order to benefit from the energy of the air movement. This portion is, therefore, not available for conversion into usable power regardless of how

---

[79]In the economic outlook on the environmental crisis, all of these problems, including also over-population and land-use, are subordinate to the problem of wealth. A full description can be found in Lomborg. The argument carefully steps around root causes, preferring instead to focus on the fact that none of the other problems can be solved without increasing the wealth of the world's nations.

[80]Consistent with our simplified view of the world, one is linked to inputs and the other to outputs of what is essentially the same process.

[81]The point here is not to question fundamental values (these would be found to be self-referential anyway) but to focus on an assessment of the understanding of the environment that the solution puts forward.

efficient our machinery is.[82]

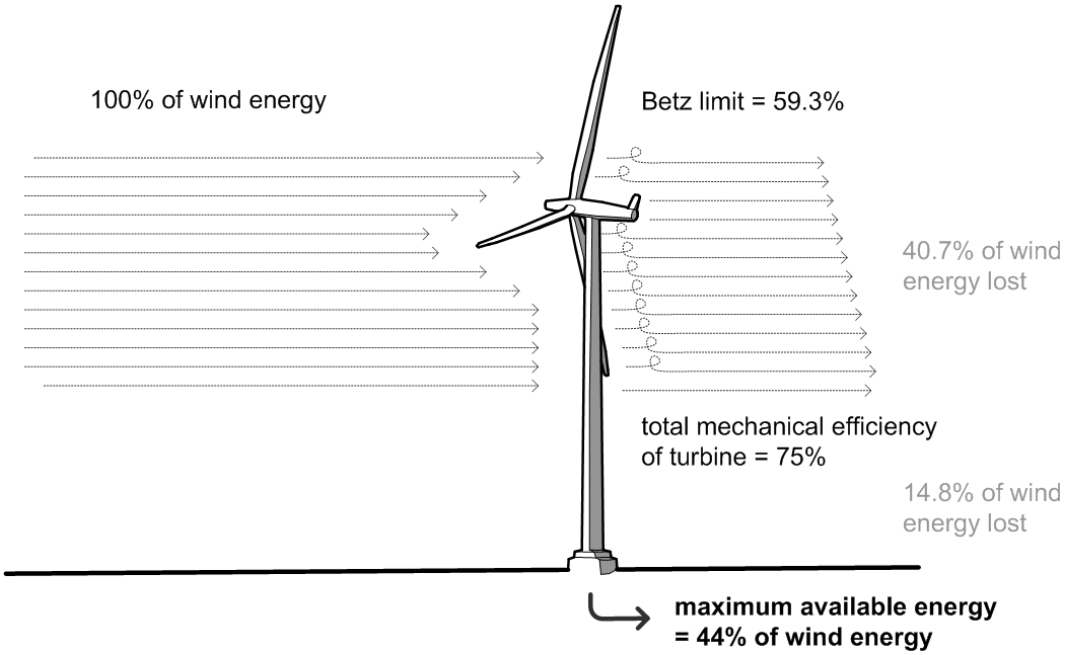


Figure 3: Net Efficiency of a Wind Turbine

In other cases, the limits are based primarily on our own technical ability. Crystal silicone photovoltaic cells have a theoretical limit of approximately 28% because of various ways that energy is lost during the conversion to electrical energy.[83] In installed photovoltaic systems other physical limitations such as quality of materials, quality of workmanship and the variability of solar exposure further modify our ability to achieve high levels of efficiency. The result is that in laboratory settings efficiencies of 24% have been reached but only 17% has been achieved in industrial production.[84] Our gains in scientific

[82]The amount of power is limited by the theoretical maximum aerodynamic efficiency of 59.2%. (www.greenenergy.org.uk/renewable_energy/wind_small.htm)

[83]Single loss mechanisms (photons with too little energy are not absorbed, surplus photon energy is transformed into heat) cannot be further improved because of the inherent physical limits imposed by the materials themselves. This leads to a theoretical maximum efficiency for approximately 28% for crystal silicon. (http://www.solarserver.de/wissen/photovoltaik-e.html#nat)

[84]In addition to optimising the production processes, work is also being done to increase the level of efficiency in order to lower the cost of solar cells. However different loss mechanisms are setting limits on these plans. Basically, the different semiconductor materials or combinations are suited only for specific spectral ranges. Therefore, a specific portion of the radiant energy cannot be used. In addition to the energy lost as heat, there are optical losses, such as shadowing of the cell surface through contact with the protective layer of glass or through reflection of incoming radiation from the cell surface. Other loss mechanisms are electrical resistence losses in the semiconductor and the connecting cabling and equipment. The disruptive influence of material contamination, surface effects and crystal defects are also significant. (http://www.solarserver.de/wissen/photovoltaik-e.html#nat)

knowledge and our increasingly sophisticated technology may close this gap but we are still bound by the limits of our technology.

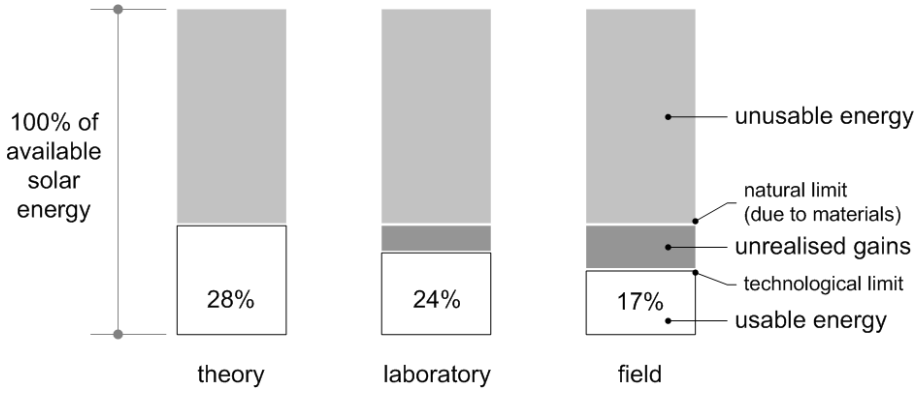


Figure 4: Practical Limits to Crystal Silicone PV Efficiency

The realisation that some limits to the efficiency of our industrial and social processes can be changed and others may not be changed is crucial to the evaluation of solutions to the environmental crisis that are based on increases in efficiency. The recovery of waste may indeed be an effective way of reducing our need for increasingly scarce resources and so an optimistic attitude might be warranted. However, a closer examination of the difference between the practical efficiency and the fixed maximum may just as well show that the conceptual and technical restrictions make the recovery of waste unlikely or impossible. As just one example, cost-benefit analysis is a typical way of evaluating development of more efficient technology. The decision to pursue development may very well be limited by what society can afford and not on what is technically possible to accomplish. However, because what is affordable and technically possible must also be subject to the limits of what the ecology of our finite world will allow, an understanding emphasising only these physical and technical limits is insufficient.

Escaping Our Natural Limitations: Factor Four

Although natural limitations have the potential to form very real barriers to improvement, many argue that the maximum possible improvement for our society in the global sense will not occur any time soon and that there is still plenty of time to become better at using what we have. The main argument for this point of view is our society's ability to constantly increase the efficiency of our technological processes. Recall from the first section of this thesis that the *Limits to Growth* simulations of the world economy were heavily criticised because, in many people's opinion, they underestimated the rate of improvement in technical efficiency. Ernst von Weizsäcker, Amory B Lovins and L Hunter Lovins, authors of the influential report *Factor Four: Doubling Wealth – Halving Resource Use*, believe that our society now has an even greater potential for increases in resource efficiency.

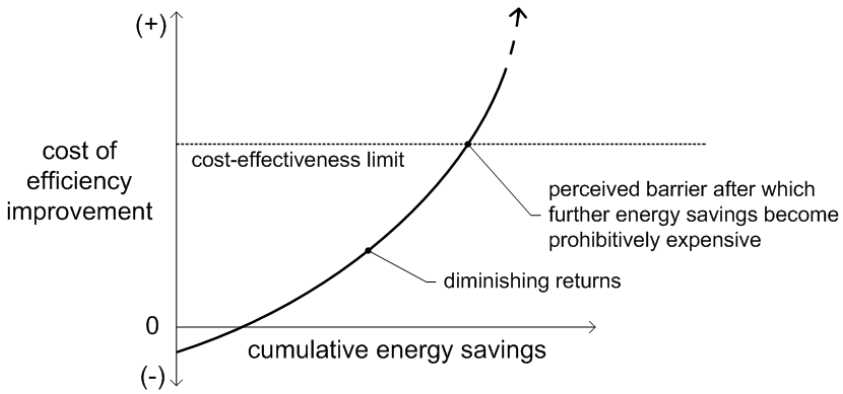


Figure 5: Diminishing Returns and The Cost Barrier[85]

Factor Four was written in 1997 for the Club of Rome, presented 25 years after the MIT researchers presented *Limits to Growth*. The *Factor Four* concept, in the authors' words, "means that resource productivity can – and should – grow fourfold. The amount of wealth extracted from one unit of natural resources can quadruple. Thus we can live twice as well – yet use half as much."[86] They explain that the focus of development – of progress – has been on the steady increase of labour productivity often at the cost of greater resource dependency. Our use of natural resources, such as energy, materials, water, soil and air, has increased to the point where it now over-burdens the natural systems that support our life. The problem, and the reason why our welfare can increase by a factor of four, is not the fact that we use an enormous amount of our available resources but the fact that we waste most of it.[87]

---

[85]Adapted from Paul Hawken, Amory Lovins and L. Hunter Lovins. *Natural Capitalism: Creating the Next Industrial Revolution.* New York: Little, Brown and Company, 1999. Page 113.

[86]von Weizsäcker, Ernst, Amory B Lovins, and L Hunter Lovins. *Factor Four: Doubling Wealth - Halving Resources Use.* London: Earthscan Publications Ltd, 1997. Page xviii.

[87]The authors reference a study by the US National Academy of Engineering which found that 80% of products are discarded after a single use. Paul Hawken, they also point out, has estimated that 99 per cent of the raw materials entering the American industrial economy become waste within 6 weeks. (Ibid., page *xix*)

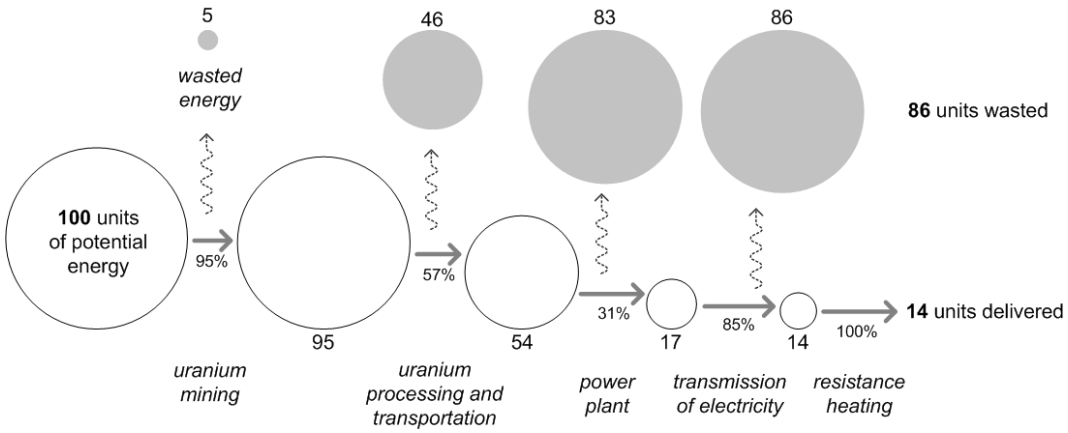


Figure 6: Wasted Energy Potential in Electrical Production[88]

The outlook for the future is presented in a decidedly more optimistic tone than the ominous forecasts in *Limits to Growth*. The authors see change as being within reach of a society that genuinely feels the need for action:

> "Yet the wasting disease is curable. The cure comes from the laboratories, workbenches and production lines of skilled scientists and technologists, from the policies and designs of city planners and architects, from the ingenuity of engineers, chemists and farmers, and from the intelligence of every person. It is based on sound science, good economics and common sense. The cure is using resources efficiently; doing more with less. It is not a question of going backward or 'returning' to prior means. It is the beginning of a new industrial revolution in which we shall achieve dramatic increases in resource productivity."[89]

The authors are careful to avoid the association of increases of efficiency with a reduction in the standard of living. The costs of the revolution in resource productivity are traditionally assumed to be beyond the means of the current economy – especially in the developing world. Von Weizsäcker, Lovins, and Lovins give 50 examples in their book to prove that this is not the case. These examples detail not only new technologies but also explain the power of "linking them together" in ways that make "big savings cheaper than small savings."[90] The key to forming these links is to find the big picture: "Advanced resource productivity requires integration, not reductionism – thinking about the design challenge as a whole, not as a lot of disjointed little pieces. It therefore fights this century's trend towards narrow

---

[88]Adapted from Miller, G. Tyler. *Living in the Environment: Principles, Connections, and Solutions,* 10th ed. Toronto: Wadsworth Publishing Company, 1998. Page 400.

[89]Hawken, *op cit.*, page *xxi.*

[90]The 50 examples, found in Part One of *Factor Four,* cover energy productivity, material productivity and transportation productivity. They range from the Rocky Mountain Institute Headquarters, where an ultra-energy efficient building allows bananas to grow indoors during a -44°C Colorado winter; to the CyberTran, a super-light train that uses one tenth of the fuel of normal transportation in a rail system that reacts quickly to meet passenger volume.

specialisation and disintegration."[91]

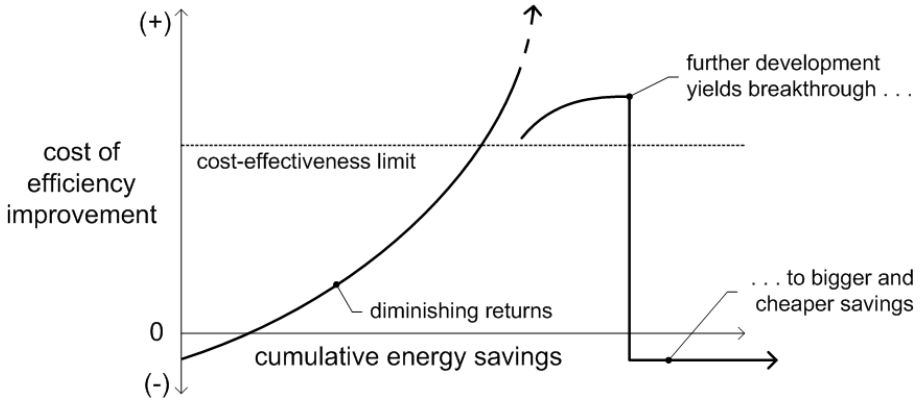


Figure 7: Tunnelling Through the Cost Barrier[92]

The Factor Four theories are demonstrated by Amory Lovins' discussion of the social context for increases in efficiency and the *smart growth* concept. Lovins points out that when looking to increase efficiency, indeed when dealing with change in technology in general, clear knowledge of the goal is crucial. For technical problems, he says, the kind of questions that you ask determine the kind of answer that you will get. Without careful thought about the end solutions, Lovins does not believe that the kind of returns for society hinted at by the Factor Four group will be achievable at a reasonable cost. For Lovins, technological improvement hinges on smart thinking and thinking outside common areas of expertise.

According to Lovins, in the rush to provide increasingly efficient sources of power, we have overlooked the overall state of our technological development. If we were to pause briefly and evaluate the broad social implications of technological applications, we would realise, he thinks, that "it is now cheaper, for example, to double the efficiency of most industrial electric motor drive systems than to fuel existing power plants to make electricity."[93] If we were aware of this fact, we would see that our goals are confused: energy-saving may be a higher priority that energy production. To confirm this thought Lovins points out that only a small amount of the total power used in an industrialised country is for what might be described as primary tasks. These tasks, include electricity for lights, motors, electronics and smelters, use only about 8% of the total power generated. A large portion of the remainder is used in low-grade applications such as water heating, space

---

[91]Ibid., page *xxvi*.

[92]Adapted from Paul Hawken, Amory Lovins and L. Hunter Lovins. Natural Capitalism: Creating the Next Industrial Revolution. New York: Little, Brown and Company, 1999. Page 114.

[93]Lovins, Amory "Technology is the Answer (But what is the Question?)" in Miller, G. Tyler. *Living in the Environment: Principles, Connections, and Solutions*, 10th ed. Toronto: Wadsworth Publishing Company, 1998. Page 426.

heating and air conditioning which can be solved by other means: for Lovins "no matter how efficiently we use electricity (even with heat pumps) we can never get our money's worth on these applications."[94] The only answer then, is to start asking the right questions about the application of our technology; that is, to develop a sense of what the technology is for.

As an example of *smart growth*, Lovins introduces the *negawatt* concept. A negawatt is a theoretical amount of useable energy produced by securing a reduction in net power use rather than an increase in electrical generation. To do this we must make strategic decisions that take the larger social picture into account: namely, we need to know how energy is used, where energy is used and why energy is needed. Lovins suggests that we should develop a priority list for power reduction starting, of course, with the low-grade uses of electricity. He lists the following specific actions in order of priority: convert to efficient lighting equipment; use more efficient electric motors; eliminate the pure waste of lighting empty rooms and offices; convert buildings to make better use of thermal insulation and solar heating; and make energy using devices as efficient as cost permits. Each of these actions generates savings (measured in negawatts) that can be used to reduce the need for power – just like the megawatts that are used to measure power generation can be. Lovins claims that these five measures could quadruple electrical efficiency in the United States without a change in lifestyle or the need for new sources of power.[95] For even greater reductions, changes in lifestyle will certainly be necessary.

A solution to the environmental crisis that manipulates technology within existing social structures is favoured by sustainable development theory. Lovins agrees that with a fair bit of ingenuity, increases in technical efficiency can achieve quite impressive results and have the potential to contribute greatly to lessening the environmental damage that our society causes. However, the point that Lovins makes in the example above needs to be considered carefully. If there is not a clear association with a long term or global objective then efforts to increase efficiency of our processes and energy sources could very well lead us in the wrong direction. Even worse, we may end up with the mistaken impression that we are making progress because by normal standards we are using less power for the process or making more money or achieving a greater degree of performance – all of these deceptively counted as positive outcomes. In the case against more power generation outlined by Lovins, the "old" mentality (that more power is better regardless of the source) combined with a separation between power production and power consumption severely limits the ability of those working within the system of make effective changes. The level of specialisation that gives us the focus on the minutia so necessary to steady improvements of our technology works also to shield us from the big picture. Without cross-disciplinary help we are often effectively blind to both the real cause of the problem and to the effective forms of solutions.

Attempting to think carefully about the big picture may introduce new ways of increasing efficiency of our industrial process by limiting resource use and lowering pollution, but it does not guarantee that real change will occur. Consider the practical application of Lovins' theory. In the negawatts example above the electricity that is saved becomes a surplus resource in the public grid. The idea is that if there is enough of this surplus and if the demand for electricity remains the same, there will be ample reason for a reduction of potential on the generating side. It is in this reduction that the real benefits - to

---

[94]Ibid., page 426.

[95]Ibid., page 427

the economics of operating the system and to the health of the environment - are realised. In the grid system, the act of saving energy does not, however, translate automatically into a reduction in energy production. The savings created by the generation of a negawatt, so to speak, are simply an illusion if they are not accompanied by an actual reduction of production - negawatts themselves do not prevent pollution or save money. What is required is a social change - an agreement that society will use less power.[96] Just as the divide between areas of expertise makes it difficult to see the big picture, the social divide between production and consumption makes it possible to be overly optimistic when we evaluate whether or not positive change has really been made.

In a not uncommon example, unjustified optimism accompanies the promotion of technology where real gains in the reduction of pollution are proposed but not guaranteed by the technology itself. The Deep Lake Water Cooling (DLWC) project in Toronto is a proposal to link the city's water supply with a heat exchanger in the downtown district-heating zone. The low temperature of the intake water from new pipes, which extend several kilometres into nearby Lake Ontario, allows the heat exchanger to remove heat from water circulating through buildings in the city commercial centre. The buildings serviced by the system can thereby offload a significant portion of their space cooling load into the domestic water supply. The consumer of water receives their water at approximately the same temperature as they would if the water was drawn from the lake at the usual shallow depth. The DLWC system is, of course, an excellent opportunity for large buildings to convert to a renewable source of cooling. But consider the following claim made by the Vice-President of Marketing for the company that is building the system:

> The system will produce an estimated total of 52,000 tons of cooling, enough to service 20 million square feet of office and commercial space while reducing local coal-fired electricity production by more than 35 million kWh each year. Emission in the form of greenhouse gases will be reduced by over 40,000 tons - equivalent to removing 8,000 cars from the road.[97]

A simple association is made between the energy saved by the operational cooling system and the reduction of the city's reliance on coal-fired electric generation plants. The problem is that the DLWC proposal itself has no direct connection to the electricity production stations that generate the pollution. The project is funded in part by the Ontario government, which does have some interest in the company that owns the coal-fired stations, but when the DLWC project is switched on there will be no automatic closure of the stations that produce the 35 million kWh of electricity. As in the case of Lovins' negawatts, further action on a social level is required to realise the actual reduction in pollution.

In the summer of 2003, the same year that the DLWC project was scheduled to begin operation, the province of Ontario experienced a power shortage that led to, among other things, government action to cap rates for electricity. Given the province-wide need for

---

[96]An agreement to use less power will likely require an understanding of how much energy is used as well as the important subtleties Lovins refers to such as the location of the energy source and the type of energy produced. All of this is a major social change in itself for a society that has been trained to focus on the end product not the stages and elements of production.

[97]Eliadis, Constantine. "Deep Lake Water Cooling: A Renewable Technology" *Electrical Line.* May/June 2003. Pages 26-28.

electricity, the savings in the power grid created by the operation of the DLWC project would almost certainly be applied to servicing the existing demand. The pressure to respond to the emergency would effectively invalidate the claim that 40,000 tons of greenhouse gases will be removed from the atmosphere by the DLWC project. In general, the growth-orientation of our economy makes it not only possible but, in fact, probable that such surpluses will be used to fuel expansion or to encourage energy dependency by lowering the cost of electricity.[98] And this, it should be noted, is a probability regardless of the good intentions and interdisciplinary thinking involved in creating the project.

In encouraging smart growth, Lovins and the Factor Four group remind us that when choosing a technical solution, we must recognise structural limitations built into our highly specialised society. If we do so, they believe, great gains in efficiency are available to combat resource use and pollution. We know, however, that the apparent benefits to society will disappear if the larger social demands of our society are not considered. Likewise, as a measure of the effectiveness of action designed to solve the environmental crisis, technological efficiency should be considered in relation to not only the demands of society but also the larger context of the environmental crisis. Increases in efficiency that minimise the use of non-renewable resources - using less coal for electrical generation for example - buy us time to convert to that use of renewable sources but does not by itself change the dependence on fossil fuel or the production of pollution that are fundamental causes of the environmental crisis.

To fail in evaluating our action to increase efficiency by even inadvertently developing a circular reference with an idea like unlimited progress–one that becomes a reason for change in itself–is to treat technological change as more than it is and risk, in the end, severing the task of developing environmentally-sensitive technologies from the proper end, which is resolving the environmental crisis. Most telling is the fact that one with an economic outlook can happily follow along with increases in efficiency and still disagree vehemently with the basic environmentalist agenda for social change.[99] We might be tempted to assume that proposals, which so easily make good economic sense, do so only because the connection to the big picture has not been made or has been argued in such a way that it can be ignored.

---

[98]The DLWC project example is from a Northern country but consider the consequences of the same situation for a developing country in the South: the temporary emergency created by a shortage of electricity in Ontario resulted in thousands of people suffering from occasional brown-outs and prompted the utility company to request that air-conditioners and other non-essential uses of electricity be voluntarily limited. The government acted to cap electrical rates and considered the construction of more power generating capacity to prevent further inconvenience. In countries to the South, less sophisticated public infrastructure could mean that even a temporary loss of power may result in a direct threat to human life and a loss of economic productivity. The pressures on the government to dramatically increase production potential rather than follow a path towards power generation balanced by need could conceivably be much greater.

[99]For example, take economist Julian Simon's argument that there is not and never will be a resource crisis is based on the idea that technological development will lead to a greater and greater degree of efficiency. As our knowledge increases and the world population stabilises, the problems that environmentalists now perceive will be solved by these means (Simon, Julian L. "There is No Crisis of Unsustainability" in Miller, G. Tyler. *Living in the Environment: Principles, Connections, and Solutions,* 10th ed. Toronto: Wadsworth Publishing Company, 1998. Page 26).

Alternatives to Efficiency

Architect William McDonough and chemist Michael Braungart take the critique of efficiency as a goal one step further. They point out that it was the Business Council for Sustainable Development who first introduced the concept of *eco-efficiency* to the global environmental discourse. Through this concept, they claim, industry hoped to "redeem its reputation without significantly changing its structures or compromising its drive for profit."[100] McDonough and Braungart define *eco-efficiency* in the same manner as the Factor Four group: the focus is on reducing the damage caused to the environment by the operation of our industrial society. Belying its roots in the business world, eco-efficiency has a noticeable emphasis on saving money and making higher profits through the practice of environmental protection. McDonough and Braungart, however, are highly critical of this approach:

> Eco-efficiency is an outwardly admirable, even noble, concept, but it is not a strategy for success over the long term, because it does not reach deep enough. It works within the same system that caused the problem in the first place, merely slowing it down with moral prescriptions and punitive measures. It presents little more than an illusion of change. Relying on eco-efficiency to save the environment will in fact achieve the opposite; it will let industry finish off everything, quietly, persistently, and completely.[101]

Where we have said that pursuit of efficiency as a goal does not in itself ensure successful action to resolve the environmental crisis, McDonough and Braungart claim that the economic base of the efficiency argument actually ensures that such action will be unsuccessful.

The limitations, which we have noticed, that are imposed by the structure of our society are of primary concern. For eco-efficiency, McDonough and Braungart write, these limits confine our problem-solving approach to simply 'doing less bad.' Eco-efficiency clings to existing social and economic structures and is therefore unable to offer a positive goal for change. Without this 'deeper' critique of the structure of our society, the eco-efficiency approach is prevented from dealing directly with information about the natural world that suggests that serious social change is necessary. The realisation, they claim, that efficiency cannot be a goal in itself leads to a radical position for evaluating our action that is free from the assumption that the existing social structure must remain intact. This then, is the first step away from eco-efficiency towards *eco-effectiveness*.

As a conceptual base for their method McDonough and Braungart, begin by discussing the difference between open and closed systems. Open systems have a direction flow such that there is an input and an output. Our society and our industrial processes are familiar examples of opened systems. Nature is, other than the limited exchange of radiation with space, a closed system.

---

[100]McDonough, William and Michael Braungart. *Cradle to Cradle: Remaking the Way We Make Things*. New York: North Point Press, 2002. Page 51.

[101]Ibid., page 61.

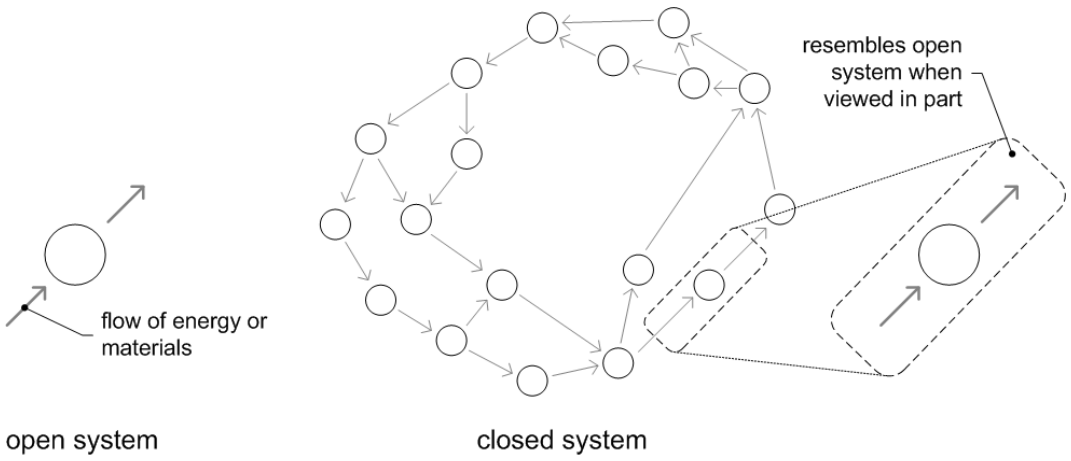


Figure 8: Open and Closed Systems, Closed System Viewed in Part

Within the natural world there are finite amounts of energy and matter flowing through interconnected processes in a circular manner. We are all quite familiar with the water cycle, for example: water, driven by energy, changing states and locations in a cyclical pattern. If viewed in part, natural processes resemble open systems and so our observation of the environment often misses the real structure of the natural world. Ecology, however, has taught us that what we once saw as many open systems are actually part of a much larger closed system - one that we don't yet entirely understand.

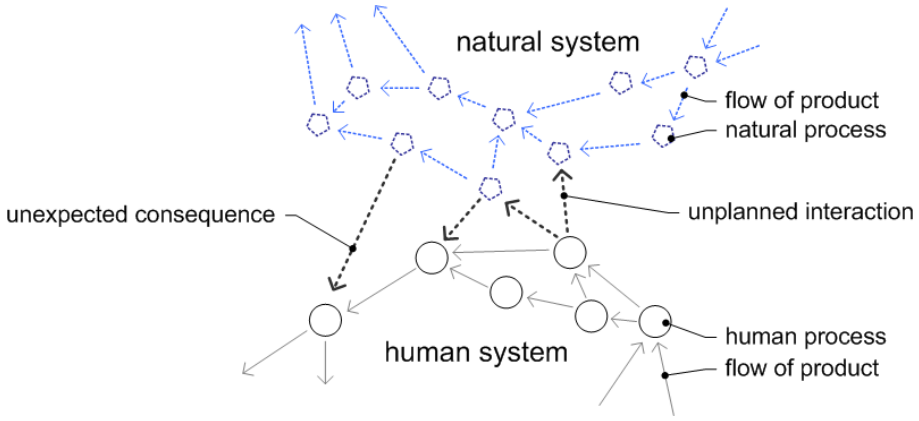


Figure 9: Part of Open System with Unintended External Links

Most, if not all of the systems that we create are organised as open systems with respect to

nature. We take materials from the natural environment, process them into products and byproducts, and then eventually release both into the environment.[102] According to McDonough and Braungart, any successful solution to the problems of resource use and pollution must accommodate our new ecological understanding of the world.

They propose as a metaphor, a world of two metabolisms: one biological and one technological. The biological metabolism is a system planned to be linked to the flows of energy and materials in the natural world. It is composed of biological nutrients and driven by the flow of energy. The term biological metabolism could equally refer to a system that exists in nature, as to one that is devised by humans. Principally, however, it is a way of thinking about how material and energy interact with the closed system of the larger natural environment. The technological metabolism is composed of technical nutrients that are the product of human society and are not intended to become part of the natural world. The idea is a fundamentally different structure for our industrial machine: a closed system, closely monitored and highly controlled. The pervasive interaction of our society with nature means that we have a hand in both metabolic cycles. Understanding these concepts, they feel, gives us powerful tools for evaluating industrial processes, and to a larger extent, all social activity in the environment.

From the base this metaphor provides, McDonough and Braungart work to explain eco-effectiveness concept in economic terms. They point out that there are dramatic inefficiencies to an open system model for industrial production. In nature, for example, 'waste' is a foreign concept. In the natural world, the products and byproducts of one process become a resource for the next. The natural world contains many species that fill extremely specific roles in turning one type of material into another for re-use. They argue that to be truly efficient, industries should recognise that there are potential resources in the waste that is generated by their products. In particular, specific materials that are intensively refined at great cost to the original producer can be recovered from the post-consumer waste, thereby saving the original investment. Structured in this way, the process would be functioning like a technological metabolism; not simply minimising environmental damage but removing it entirely. If an industry produced no waste at all then we might consider it to be maximally efficient. If it did so in a way that also eliminated damage to the environment, then McDonough and Braungart would consider it to be a start towards eco-efficiency. Seen in this light, eco-efficiency is a fundamentally different concept than the version of efficiency recommended by the Factor Four group. At its core is an understanding that the interaction of our society with the natural world is where damage to the environment can really be avoided. The proposed twin cycles of materials and energy provides a more successful image of what a sustainable society might be like.

---

[102]This way of thinking is reflected in the history of our understanding of pollution: before the recent increase in global trade, the atmosphere was seen as a limitless sink that would dilute pollutants released into the air. The search for explanations for damage to pristine wilderness in remote locations led to a new understanding of the atmosphere that conceptually closed the loop between source of pollution and the distant effects. The popular understanding of the environment (the air, the land, and the water) as an unlimited dumping ground still remains.

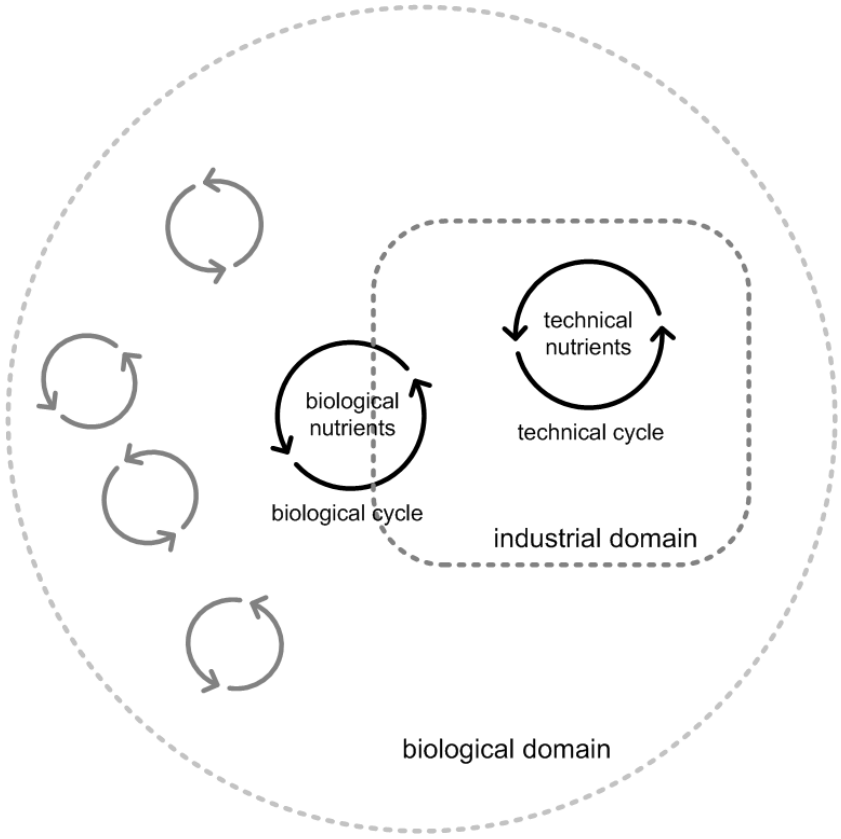


Figure 10: Biological and Technical Metabolisms in Nature and Society

As an example of how their method can be applied, McDonough and Braungart introduce a project of their own for the textile company DesignTex.[103] They were asked to develop a compostable fabric with Röhner, a Swiss textile mill. Together with Röhner they chose to create a product that would be a biological nutrient able to be safely disposed of in a natural system, rather than a technical nutrient that would have required re-processing at the end of its service life. The design process for the biological metabolism led to a rejection of so-called hybrid products, such as a recycled plastic fibre and cotton composite, in favour of a weave of wholly natural fibres. For finishes, like fabric dyes, and for the chemical processes used in manufacturing,, their work narrowed down choices from a typical selection of several thousand chemicals used in the industry to only thirty-eight that were deemed safe enough for the biological cycle. The design process employed relied on the idea that chemicals should be filtered out of the product before production not after they had already been used. In the end, the product chosen for production was cheaper to produce, in part due to the simplification of the process that the design work allowed for.

In addition to the positive changes to the process and the product, McDonough and Braungart report a broader set of social and environmental benefits. The mill plant was changed from a dangerous, chemical-filled shop to a healthy and productive work

[103]Ibid., pages 105-109.

environment. After the changes, workers were no longer required to wear protective gloves and air filters. Government regulators testing the plant's effluent were surprised to find that the water leaving the plant was as clean as, or cleaner, than the water going in. Paperwork that went along with the use of toxic chemicals was also, thankfully, eliminated. In this case, McDonough, Braungart and Röhner were able to achieve the large-scale interdisciplinary thinking that is encouraged by Amory Lovins – and the resulting increase in efficiencies should be obvious. What separates this approach from Lovins' *smart growth* plan is the ecologically balanced perspective which leads to results that could realistically be said to achieve zero net resource use and zero pollution.

For companies willing to put aside the pursuit of efficiency, the eco-effectiveness method is outlined in five steps. The first is to get 'free of' chemicals and materials that are known to cause problems – especially those that are known to be bioaccumulative – by simply removing them from consideration at the beginning of product design process. McDonough and Braungart do admit that this approach is problematic without some degree of certainty that the replacements are actually better and won't cause problems of a different type. The second step is to become personally aware of what the right choices are and begin to slowly make improvements as new knowledge and experience is acquired. The next step is to record this knowledge in the form of a 'passive positive' list that separates the safe chemicals from the questionable and known bad ones. The formation of this list should reflect careful and sometimes extensive, research of the properties of every chemical on the list. This list becomes a 'palette' for design. The fourth step is to really begin to use this palette. All components of the design are now understood and the designer, they feel, can be confident in the eco-effectiveness of the product created. The fifth and final step is to aggressively reinvent:

> Now we are doing more than designing for biological or technical cycles. We are recasting the design assignment: not "design a car" but "design a 'nutrivehicle.'" Instead of aiming to create cars with minimal or zero negative emissions, imagine cars designed to create positive emissions and generate other nutritious effects on the environment.[104]

At this stage, McDonough and Braungart are looking for innovations that address the broader social context of industrial products, aiming to surpass the structural limitations of our society and deal directly with natural limitations. With this suggestion, they refocus the discussion from the steady increase in the efficiency of industrial processes, to a dramatic source of change in our society: innovation.

Innovating Solutions

Innovation involves changing the rules, whether they be conceptual or structural, and redefining the technical problem so that the physical limitations encountered don't matter any more. Solutions involve reinterpreting the form of the problem, the form of the solution or both. Innovation is an imaginative process that involves the special potential of the human mind to picture a reality different from the one we currently have. However, without an understanding of the broader social and environmental context, innovation, like

---

[104]Ibid., page 179.

efficiency, can be considered a measure of success in itself.

For those who consider the environmental crisis a technical problem, innovation is the primary mode for drastic change. Innovative technology can change the very structure of our global society. This is partly due to the fact that the world is increasingly sharing a single culture of industrial production. Innovation can be cultural rather than technological. Social institutions and the cultural values that support them are also subject to the influence of the increasing interaction between previously isolated cultures. Transmission of cultural information occurs rapidly and easily so the innovative change to our society may happen much faster than ever before.

The effects of innovative technology are subject to unique limitations which are largely related to the structure of our society. Even if the new invention presents a measurable improvement over its parent technology, there is no guarantee that it will be considered appropriate or useful. Take, for example, the electric powered vehicle. At the beginning of the automotive age, electric vehicles were common, particularly for service vehicles on urban routes. American cultural historian J.B. Jackson writes that the electric powered trucks of 1910 were "a great improvement over the horse-drawn wagons or surreys or buggies previously used. They made no noise, they did not smell, they were easy to drive, and very sturdy."[105] The advantages of the gasoline powered engine, however, allowed for larger loads to be hauled at a faster speed and these vehicles were chosen over the quieter but slower electric trucks. Eighty years later we are becoming increasingly concerned as a society about air pollution and noise pollution in our cities. These qualities, present in technology discarded many years ago, are once again in demand.

We have a well-documented string of successes through innovation. What were in one age seen as absolute limits are now easily surpassed by our technology. Looking at historical examples, we find repeated cases of situations that were, at the time, thought to be inescapable and find again and again, unexpected solutions that spring from human ingenuity. Author of *The Skeptical Environmentalist*, Bjørn Lomborg, cites several of these situations in support of his claim that all of the doomsday predictions made by leading environmentalists have failed.[106] In no case, says Lomborg, have these been even remotely close - we have found solutions long before the critical point has been reached. Lomborg and Simon[107] both point out rightly that the impact of this new technology was unexpected and has changed the ground rules for energy since. This is an important response to the notion that the environmental problem has put our society in a state of crisis, which is a long-standing tenet of the environmentalist discourse. The fact that innovations almost by definition cannot be predicted ahead of time is used to strengthen their observation that the steady chain of innovations, which has dramatically changed global society for the better, will continue indefinitely, effectively eliminating any cause for concern so long as the necessary social and economic development continues to support our technical development.

---

[105]Jackson, John Brinckerhoff. *A Sense of Place, A Sense of Time.* New Haven: Yale University Press, 1994. Page 174.

[106]Lomborg gives many examples that address a wide range of environment issues. See: Lomborg, Bjørn. *The Skeptical Environmentalist: Measuring the Real State of the World*. New York: Cambridge University Press, 2001.

[107]Simon, Julian L. "There is No Crisis of Unsustainability" in Miller, G. Tyler. *Living in the Environment: Principles, Connections, and Solutions*, 10th ed. Toronto: Wadsworth Publishing Company, 1998. Page 26

A favourite example of those who would support this argument is the timely advent of nuclear power to fill the need generated by the recurrent energy crises due to shortages of fossil fuels. France in particular has now developed an extensive system of nuclear power generating stations to change its dependency on imported fuels. Nuclear power is seen as the saviour for rapidly developing countries in the South. What is typically not accounted for are the unpredicted problems that come along with a newly developed technology. In the case of nuclear power, however, the dangers are obvious. The failure of the Soviet reactor complex at Chernobyl in 1986 and the resulting environmental catastrophe happened close enough to the developed European countries to create broad concern amongst citizens of the developed world. In some countries, such as Finland, nuclear power has been voluntarily banned in response to this concern - a move that has effectively eliminated the possible benefits of this technology. The generation of radioactive waste is generally considered a major concern although it could be argued that the quantity of this material is relatively small and is intended to be carefully supervised. The question of long-term storage, however, remains a problem. Proposals for waste to be held in politically and seismically secure locations are generally met with stiff resistance by neighbouring communities. More recently, terrorist attacks against significant targets in Northern countries have raised in the public consciousness the possibility of a deliberate nuclear malfunction. Questions about the unknown or unattended consequences of new technology make the claim seem naive that we can relax our efforts to solve the environmental crisis.

The progress of our society has unquestionably engendered a feeling of confidence in our ability, as a society, to solve problems through technical means; indeed, the current material wealth of our society is largely considered to be due to the steady stream of innovations. This confidence is reflected in the value that is attached to technologies that are novel or replace existing technology. In Northern countries, the automobile is a good example of how the value of newness in recognised. The most recent technological improvements of new cars, such as improved aerodynamics and independent suspension systems, are a focus of our attention and often are the selling point. The technology itself is in a process of refinement - of increases in efficiency - not revolutionary development. The appearance of innovative developments is just as important in the mind of people buying cars. The process through which innovations occur also has acquired a strange distortion in popular imagery. The creative act that sparks an innovative development has a kind of magical quality about it. Some individuals, businesses and institutions within our society are able to bring this forth in times of need. Creative responses to problems are therefore not only considered a natural power of the human imagination: they are the products of people who are the driving force behind the progress of our society. But a reliance on innovation as a goal does not get us any closer to solving the environmental crisis.

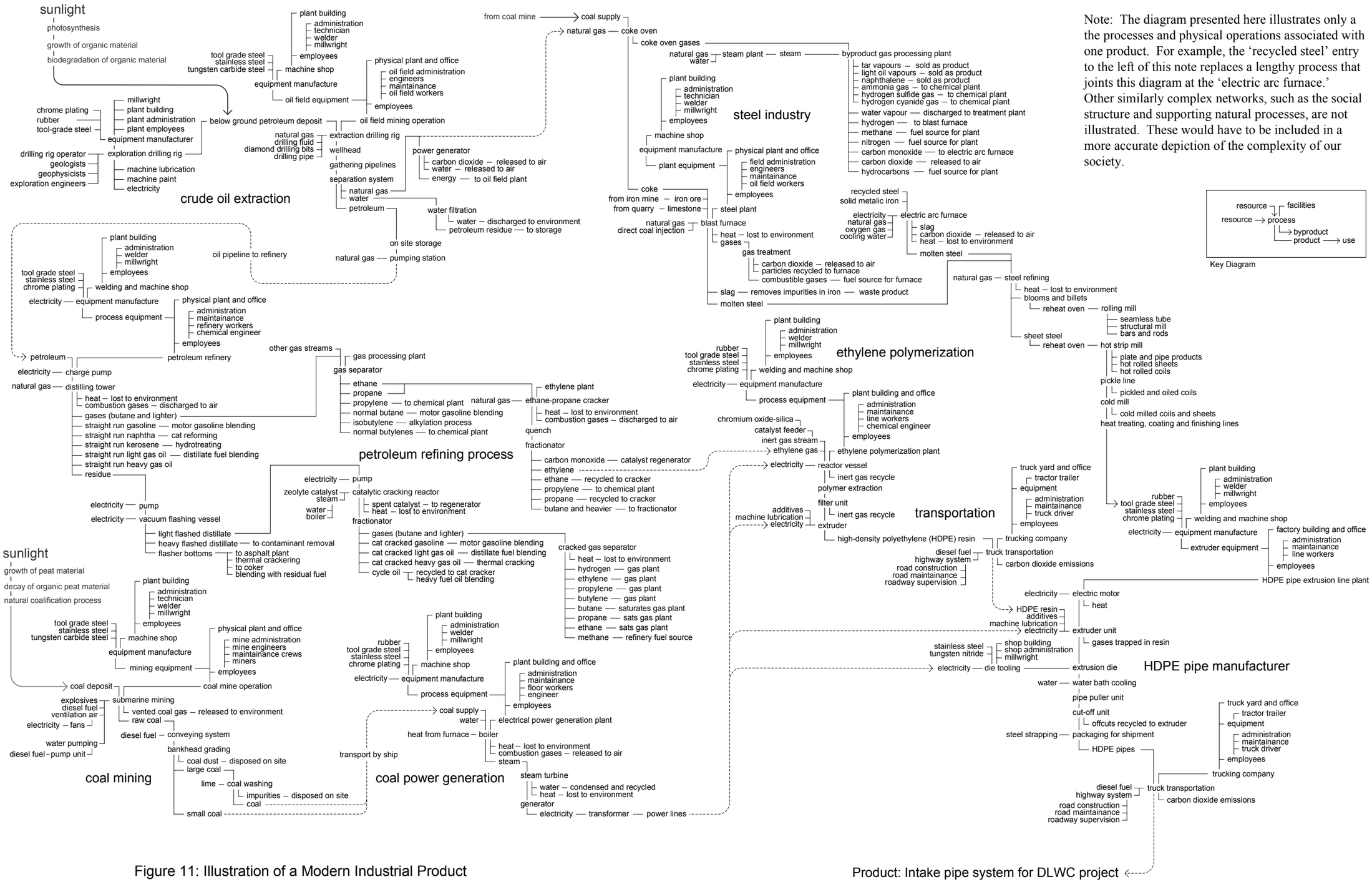
Together these points contribute to an unjustified overconfidence in the ability of our society to meet the crises that we face. Although there are some grounds to think that the process that we have established to concentrate energy on development of our technological resources might lead to innovation in a repeatable and consistent way, there is a risk of ignoring the effect of our technology at the larger level. We must pay attention to the conditions that our innovative powers are based on. Knowledge is one, time is another. In the situation of complexity that we have discussed in reference to increases in efficiency, we must doubt our ability to successfully predict the outcome of experiments that are conducted in the environment.

We have a limited ability to understand the consequences of our actions in the long term. It has been shown in a number of examples that what we thought to be a perfect

solution actually created more complex problems. The time constraint on our innovative process is another real limitation. If there is, as environmentalists claim, a rapidly approaching deadline for change to be implemented, we are not in an ideal position to trust that the solution will be found in time. We know that there is much to know about the world that we live in both to understand our present situation and in order to find a viable solution.

For problems such as climate change this is particularly clear. Scientists remain confident in their ability to learn enough to solve the problems we face if they are given the proper amount of time. Their warnings that our present path is increasing the rate of damage to the environment should be considered to add significant time pressure and may ultimately remove the possibility of finding a solution. They also point out that we have reason to think that the changes that we make to the environment are irreversible. If we are not sure how severe the damage is, we might be wise to delay the process to best preserve the life that we have for study.

The risks are too high for the "works best under pressure" scenario. Our technological engine is moving ahead driven by economic concerns that are based on theories that have little or nothing to do with our current scientific knowledge and in the meantime, our confidence in our ability to innovate causes us to ignore many of the problems that have been raised. The matter of the unintended consequences of our actions should pose a serious challenge to the confidence that we have in our ability to achieve advances in technological efficiency and to use innovative solutions to overcome the natural and social limitations that we are faced with.



Note: The diagram presented here illustrates only a the processes and physical operations associated with one product. For example, the 'recycled steel' entry to the left of this note replaces a lengthy process that joints this diagram at the 'electric arc furnace.' Other similarly complex networks, such as the social structure and supporting natural processes, are not illustrated. These would have to be included in a more accurate depiction of the complexity of our society.

Key Diagram

Figure 11: Illustration of a Modern Industrial Product

Product: Intake pipe system for DLWC project

Complexity in Industrial Society

Our modern industrial society has become exponentially more complex since the beginnings of the industrial economy more than 300 years ago. Two factors contribute to the complexity of modern industry (this is to say nothing about the rest of society): first, is the specialisation of production and second is the scale of production. The diagram entitled "Illustration of a Modern Industrial Product" shows the levels of specialisation and interlinked industrial processes for one common product: high-density polyethylene (HPDE). Noted in the diagram are the sub-processes of production from mineral extraction through various levels of manufacturing to the finished produce. Partially indicated on the diagram are links to other, related processes upon which the manufacture of HDPE depends - the production of metal for machine parts, for example. It is a simplistic model but is enough to show the pieces involved and to imagine the flow of materials through each step.

What the diagram shows is not only the complexity of the supply chain but also the interconnectedness of the parts. For example, the basic feed stocks for HDPE are obtained by the same process that yields the fuel that is used to transport the material through various stages of processing. The diagram does not identify the social apparatus that supports and depends on this chain of production but one could easily imagine the network of jobs, of consumer/producer relationships, of community links, that would fall behind almost every entry on the diagram. Each entry is a specific area of human concern. There are people involved at every linkage between entries. There are even people that oversee or care for large divisions of the process. The type of change that is required by both Lovins and McDonough and Braungart requires not only an understanding of large areas of this diagram but also of the consequences that fall out from it. The success of the solutions that they propose also requires the knowledge that what changes we have made do not create further problems. Clearly an evaluation of this type would be very difficult to obtain with any real degree of certainty.

One could also imagine the physical linkages that would extend off this diagram. High density polyethylene is one of the more ubiquitous materials in use in our society. The intake pipes for Toronto's Deep Lake Water Cooling project is the end use listed here. There are thousands of products that would share a similar chart - each one would have a different series of social connections. The DLWC project is not even the end use. It is connected (as described in the section above) to the city's domestic water system as well as the downtown area's district cooling system. Therefore it is deeply integrated into the physical operation of an entire city. In assessing the impact of the DLWC project or the use of HDPE or virtually any product of our modern industrial society, the whole diagram of relationships and the social and physical infrastructure that stands behind it must be taken into account.

The other factor that contributes to the difficulty of this analysis is the scale of production. The diagram discussed above does not express quantities[108] and it does not

---

[108] It is difficult to convey an impression of the scale of production that does not overwhelm and therefore counteract the point being made: we have few suitable personal references for the number of people in the world, the amount of material being cycled through our society, the amount of land that we occupy or even the amount of money that is changing hands, all of which is tied up in the process of production. A notable exception to this is the ecological footprint concept, which describes in geographical terms the natural resources required to support our lifestyle (see Rees, William. "Ecological footprints and appropriated carrying capacity: What urban economics leaves out" *Environment and Urbanization*, 1992, Vol. 4, Issue 2. Pages 121 -130).

reference geographic location. With regard to the latter, the distance that might exist between steps in the process might reasonably be from neighbourhood to neighbourhood, or from city to city, or region to region, or country to country. A detailed example of the global nature of production was prepared by provided by James Womack and Daniel Jones in their book *Lean Thinking*. The case study is retold by authors Paul Hawken, Amory Lovins, and L. Hunter Lovins. Womack and Jones trace the production and distribution of a can of pop destined for the English consumer. Starting with the material for the can itself they trace the path from bauxite mines in Australia, to a chemical reduction mill that produces alumina, to Sweden or Norway by ship to the aluminum smelter, then to an aluminum mill in Germany, a fabrication plant in England and finally to a bottling plant. The beverage product itself is made from ingredients from France, the United States and England. The packaging for the finished cases of the product from Sweden, Siberia or Canada.[109] In our global economy it is increasingly more common to find a great distance between the centres of production and the location of consumption. In analysing the implications of a product or process, industrial production therefore becomes thoroughly entwined in international politics. The very framework for analysis must shift from place to place to accommodate different climates, cultures and governments.

Tracing the consequences of our actions through these paths, as both Lovins, McDonough and Braungart ask that we do, should be seen as next to impossible. Lovins' smart growth requires that we judge our attempts to increase efficiency by the effect that they have on the big picture. Given the complexity of the industrial and social processes that we are dealing with, our ability to make these judgements accurately seems questionable. As Lovins points out, if we are able to increase efficiency on a small scale we may be congratulating ourselves too early because we have focused too narrowly and therefore miss opportunities to make a more significant change. The complexity of our society means that even if we think on a larger scale, which is the basic principle of smart growth, we still may not make achieve a comfortable level of certainty that our actions are making real change. Optimising the efficiency of the larger system is still likely to be subject to the kind of blindness that Lovins identifies at the local level. The unintended consequences are difficult to track and the structure of the system resists change.[110]

Complexity in Nature

Our scientific understanding tells us that nature is a closed system - interconnected and interdependent. Our scientific understanding, however, has only begun to study the complexity of this community of living beings. Environmental activist Aldo Leopold, a former professor of Wildlife and Game Management declares that "The ordinary citizen today assumes that science knows what makes the community clock tick; the scientist is equally sure that he does not. He know that the biotic mechanism is so complex that its

---

[109]A full description of the case study is presented in: Hawken, Paul, Amory Lovins, and L. Hunter Lovings. *Natural Capitalism: Creating the Next Industrial Revolution.* New York: Little, Brown and Company, 1999. Pages 49 -50.

[110]Lovins is aware of the fact that society does not change willingly - recall that he mentions that a factor of 4 increase in electrical efficiency can be accomplished with *no change to our present lifestyle*.

workings may never be fully understood."[111] He made this statement about 50 years ago but today we find that the situation has not changed that much. Canadian scientist David Suzuki points out that more research has only confirmed our ignorance: "The problem is that despite the impressive scientific gains made in this century, what we know is utterly minuscule compared with everything that remains unknown or not understood."[112]

Trying to change the perception that we know a great deal about the way that the world works is a problem for scientists' who understand the world's complexity. In doing this, scientists are limited by the objectivity that is imposed on them. Just as specialisation in other areas of society prevents a wide view of the problem and a true appreciation of the complexity of the world around us, the objective eye with which scientists must treat their area of expertise discourages statements about issues that extend past the narrowly defined disciplines. They are left in the uncomfortable position of "seeing" that our impact on the natural environment has complex consequences that we are not currently able to predict, understand or control. At the same time scientists are unable to pass judgement on our actions or even advise caution without compromising their objectivity and their careers. The speculations in this regard quite often lead to a political position that discredits the trust that we have in the dispassionate reporting of normal science.

Some scientists have stepped outside of this structure to explore alternate ways of understanding what they see in nature. Starting with the understanding that the world is inherently complex - that is, that complexity is a fundamental condition of the world that we live in - they criticise normal scientific method as being mechanistic and reductionist. These two characteristics are seen to be fundamental impediments to properly understanding the world and addressing the environmental crisis. The basic assumption of our society has been that the fundamental structure of the world is simple and therefore understandable and predictable. The mechanistic view that the operation of the world can be described through the analogy of a machine with regular motions and predictable causality does not, they feel, adequately represent the irregularity that we see in the natural world. The traditional approach to scientific knowledge attempts to reduce knowledge we have gained to simple, coherent facts and attributes to them the status of truth.

Systems ecologist James Kay and his colleagues point out that this approach devalues the relationships between fields of knowledge and therefore works against our ability to form a comprehensive understanding of the natural world. Normal organisation of the knowledge that we have, therefore, is seen as being a major limitation to our ability to depict the world as it is. Normal science, Kay argues, fails in its essential role of providing information to the decision-makers in our society because it cannot overstep these limitations without compromising its credibility.

Kay suggests an approach based on complex systems theory.[113] The study of complex systems in ecology was initiated in an attempt to explain unpredictable

---

[111]Leopold, Aldo. *A Sand County Almanac: With Essays on Conservation From Round River*. New York: Ballantine Books, 1966. Page 240.

[112]Suzuki, David. “Episode 1: Journey into New Worlds” *The Sacred Balance.* Toronto: Canadian Broadcasting Corporation, 2003. Video.

[113]Kay, James J. “Ecosystems, Science and Sustainability,” in Ulgiati, S., Brown, M.T., Giampietro, M., Herendeen, R., Mayumi, K., (eds) Proceedings of the international workshop *Advances in Energy Studies: Exploring supplies, Constraints and Strategies*, Porto Venere, Italy, 23-27 May, 2000. Pages 319-328.

irregularities in seemingly simple systems and the surprising appearance of order in seemingly random situations. Advances in the science of thermodynamics and modern science's increasing appreciation of nature's complexity strongly suggest that ecological systems should be understood as complex systems rather than simple sets of relationships. The consequence of this understanding of nature is that our traditional view of the world around us as orderly and predictable – at least in a linear or mechanistic sense – will be found to be inadequate for forecasting the real effects of our actions.

In Kay's work, ecosystems are portrayed as 'Self-organising Hierarchical Open systems' or SOHO systems. These systems are described as 'open' because they are primarily seen as dissipating energy. The property of self-organisation refers to the structures that develop spontaneously to make use of the energy entering the system. Since the common element of the familiar relationships between plants and animals is taken to be the transfer of energy, all living things can be described according to their role in this process. Being hierarchical in nature, these structures may be viewed from many different perspectives. Scientists, under this view, must balance their understanding of ecosystems between different perspectives at different scales, forming the explanations of what they see into narratives that discard mechanistic certainty for probabilities within the larger context of the system studied.

In this way, the reality that we know very little about the way the natural world works is integrated into an approach that has the possibility of better informing our decisions about the environment. To address concerns about the long-term sustainability of our society, Kay proposes an "Adaptive Management" approach. For Kay, this approach is not possible without a fundamental shift in both our scientific method and our decision-making processes. With respect to our scientific method, he proposes a post normal science:

> "In post normal science, the scientist's role in decision making shifts from inferring what will happen, that is making predictions which are the basis of decisions, to providing decision makers and the community with an appreciation, through narrative descriptions, of how the future might unfold."[114]

Since the SOHO system does not consider there to be an 'ideal' or 'normal' state for any given ecosystem, environmental policy decisions must include an expression of what society's vision for the future may be. In establishing this vision, concepts of sustainability and ecosystem integrity are fundamentally useful. These statements of value are used to collaboratively determine the preferred state of the ecosystem that the environmental policy will work towards. Because narratives present information about the environment in terms of probable outcomes, Kay sees an ongoing and evolving adaptive management process as necessary to respond to both the changing environment and changing social values (see Figure 13 below).

In this theory we find a way of accommodating the inherent complexity of nature into our understanding of the world around us, and so satisfy the criticism that was levelled against normal science. The narrative format Kay presents also works towards the problem of being able to act with some degree of confidence in an environment where certain knowledge of the consequences of our actions is unlikely. Although Kay recommends an enlarged role for the scientific community in decision-making based on their ability to more

---

[114]Ibid., page 325

accurately portray our relationship to the environment, he avoids overt analysis of the social values that guide our action. For Kay, these values play a role in determining the appropriateness of the narratives and in determining a vision of our future relationship with the environment but they are otherwise excluded from the scientist's realm of responsibility.

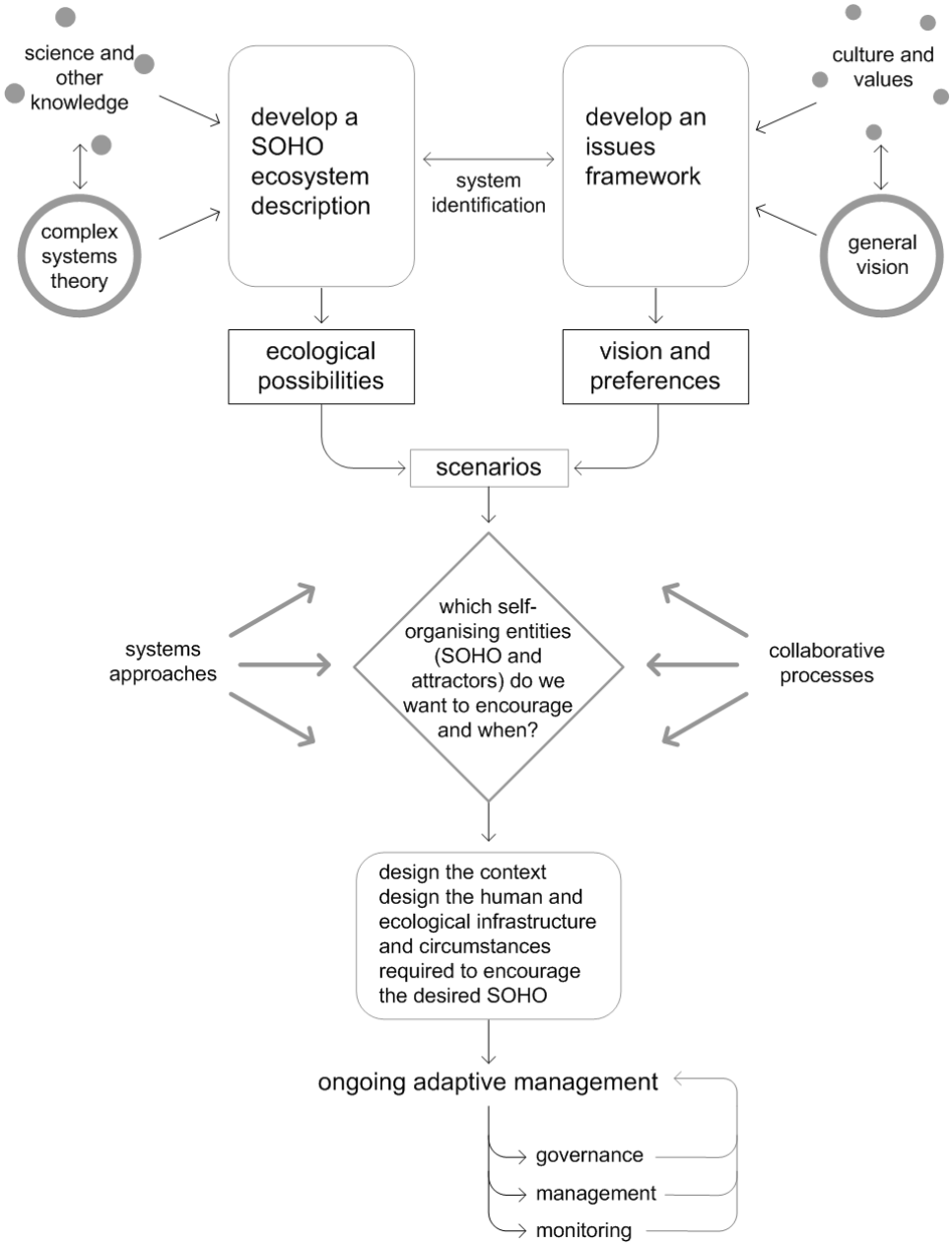


Figure 12: Conceptual Structure of the Adaptive Management Approach[115]

[115]Adapted from Kay, James J. "Ecosystems, Science and Sustainability," in Ulgiati, S., Brown, M.T., Giampietro, M., Herendeen, R., Mayumi, K., (eds) Proceedings of the international workshop *Advances in Energy Studies: Exploring supplies, Constraints and Strategies*, Porto Venere, Italy, 23-27 May, 2000.

The Impact of the Cultural Component

A tendency to rely on technological change to 'manage' the environmental crisis has been consistent in most of the solutions that have been discussed in this section. For many of the problems that we face, development of new technology is suggested as a solution that overcomes the need for dramatic changes to our society and to our lifestyles. Amory Lovins for example, phrases the Factor Four goal in a way that avoids direct discussion of a lifestyle change. McDonough and Braungart are concerned primarily with changes to the way that we design products and processes, even if the way of thinking that they propose may ultimately lead to technologies that will have a revolutionary effect on our lifestyles.

Perhaps the most significant criticism of the technological development argument made in this section is that it fails to account for several fundamental facts about the world that we live in. We have discussed two in particular. First is the general complexity of both our society and the natural world; and associated with this is the difficulty we have in knowing the world around us. Second are ecological concepts such as the interconnectedness and resulting interdependence of the living world that we belong to. Neither one of these issues is adequately addressed by the view that proposes technology alone as an effective solution.

From a different perspective, systems ecologists tackle the problem of knowing the world around us by proposing a method for balancing the requirements of the natural world against the needs of our society. The balanced approach has some promise both as a critique of our normal scientific understanding by revealing its inadequacies, and as a commentary on our typical decision-making processes by proposing an alternate approach. The collaboratively developed scenarios incorporate a sense of how the world should be in ecological terms - an important element that has been found missing in the technologically-based approaches. It is the scientist, after all, who understands the complexity of nature and how little we know of it, possessing, therefore, a critical vantage point from which to comment on the adequacy of the social structures that guide our society towards sustainability.

Although the contribution of systems ecologists may be able to correct the key shortcomings found in the technologically-based solutions, it stops short of fully addressing the underlying cultural values that govern the way that we attach value to the environment and ultimately define our worldview. Recall, for example, Figure 12, which illustrates the adaptive management model. The diagram makes a clear separation between our scientific knowledge, our 'culture and values,' and the decision-making process itself. Both are treated as contributions from external authorities, and neither one is open for analysis.

The continued unexpected and unintended consequences of our actions demonstrate that our scientific understanding of nature and the values that our society holds must be called into question. The difference between how we expect the environment to respond and how it actually does–which has been a major challenge for the solutions that have been reviewed in this section–is symptomatic of our inability to accommodate the complexity of both global society and the natural world. David Suzuki thinks it irresponsible to place so much confidence in our scientific understanding of the world and our assumptions about how the world can be managed:

> Science provides tiny, fragmentary insights into the natural world. We know next to nothing about the biological makeup of Earth's life-forms, let alone how they are interconnected and interdependent. Nor do we understand the physical features and

> complexity of the atmosphere, landmasses and oceans. It is a dangerous delusion if we think we know enough to 'manage' forests, climate, water or wild ocean or land animals.[116]

Nature, Suzuki says, has its own processes to control and regenerate the conditions that support life. Since we cannot yet understand this regenerative capability, Suzuki advises, we must not assume that restoration of the environment will be inevitable or that we can some how control or direct these forces. If there are conflicts between the natural world and our society, then we need to manage our own activity as best we can, cautiously enough to allow natural processes the time and space to recover, and our society the time to learn about them.

The shift in our approach to living in the world that Suzuki recommends is significant: "In the end, the crucial change is attitudinal; we have to see ourselves in a different relationship with the rest of nature."[117] What he recommends is above all a cultural change: an understanding of sustainability that follows from a revised worldview that includes our understanding of our complex position in the world's ecology. Under this view, there can be no separation between the decisions we make, what we know about nature, and how we place value on environment - all fundamentally interlaced by the need to protect the environment that sustains our life.

In the following section this unity of purpose is explained as a culture of environmentalism - a complete system which addresses a change in our worldview, a new sense of value for the environment and an environmentalist ethic. None of these cultural components are in themselves particularly unusual: the solutions examined in this section alone have shown a consistent sympathy to this idea beneath their more overt accommodation of the dominant economic values that support our current decision-making. James Kay's work, for example, recognises the importance of healthy ecosystems and so elevates the independent assessment of ecosystems to an equal standing with the requirements of our own culture. The adaptive management approach - at least in conceptual terms - acknowledges the functioning of nature as a real context for our own society. McDonough and Braungart conclude *Cradle to Cradle* with an appeal for change based solidly on environmentalist values, demonstrating clearly their understanding of the cultural basis for change:

> Ask: How can we support and perpetuate the rights of all living things to share in a world of abundance? How can we love the children of all species–not just our own–for all time? Imagine what a world of prosperity and health in the future will look like, and begin designing for it right now. What would it mean to become, once again, native to this place, the Earth–the home of *all* our relations? This is going to take us all, and it is going to take forever. But then, that's the point.[118]

---

[116]Suzuki, David with Amanda McConnell. *The Sacred Balance: Rediscovering Our Place in Nature*. Toronto: Greystone Books, 1997. Page 152.

[117]Ibid., page 156.

[118]McDonough, William and Michael Braungart. *Cradle to Cradle: Remaking the Way We Make Things*. New York: North Point Press, 2002. Page 186.

3: Foundations for a Lasting Solution

Section Summary

The final section of this thesis argues that an environmentalist ethic is the effective solution to the environmental crisis.

The problem posed by the need to create a sustainable society is shown to be an ethical one. The critique of proposed solutions given in the second section determined that the heavy technical and economic bias of our current approach fails to accommodate ecological precepts, such as our society's dependence on nature, and the real limitations posed by the complexity of the world that we live in. Based on these conclusions, the claim is made that the response to this ethical dilemma–an environmentalist ethic–should be based on ecocentric values.

The concept of intrinsic value in Arne Naess' *deep ecological approach* is introduced as a framework for understanding the ecocentrist position. The intrinsic value of nature is then contrasted to the instrumental value of nature typically understood by our society. Bruce King's unfavourable reaction to Naess' argument is registered and his demand for an understandable context for ecocentric concepts is used to establish criteria for cultural acceptance of the proposed environmentalist ethic.

Aldo Leopold's proposal for a *Land Ethic* is presented as an example of an ethic based on ecocentric values. Leopold's theory rests on the development of an ecological consciousness, which stems from a deeply personal experience of nature. J. Baird Callicott finds further justification for the environmentalist ethic in Leopold's commitment to a bio-social basis for ethics.

In conclusion, the environmentalist ethic is demonstrated to have the potential to generate effective and durable strategies to resolve the environmental crisis.

Part 3: Foundations for a Lasting Solution

Introduction: The Ethical Compromise

Efforts at achieving a sustainable society are heavily influenced by the 'development' argument: that is, that the only chance for long-term salvation from the environmental crisis is through the industrial and social development of all countries in a concerted effort to provide the technical resources necessary to combat environmental problems.

Economist Julian Simon assures us that, from a resource point of view, there is no danger of our profit-motivated activity exhausting the ability of our technology-rich society to meet the needs of an increasing population: "Given some time to adjust to shortages with known methods and new inventions, free people create additional resources."[119] For these reasons, our society will not be constrained by the limited resources of a finite planet. Simon accepts that problems will appear from time to time but claims that "the world's physical conditions and the resilience of a well-functioning economic and social system enable us to overcome such problems, and the solutions usually leave us better off than if the problem had never arisen."[120]

Bjørn Lomborg agrees that environmental problems can be solved through our current way of thinking. As support he cites the increasing degree of health and well-being that our industrial society has bestowed upon its members and links the worldwide upwards trend in standard of living to the global efforts at economic development:

> *We have more leisure time, greater security and fewer accidents, more education, more amenities, higher incomes, fewer starving, more food and a healthier and longer life.* This is the fantastic story of mankind, and to call such a civilization "dysfunctional" is quite simply immoral. In the developing world there are still many who lack the basic necessities and for whom growth and development are not an inconsequential experience of plastic flowers, microwaved food, alcohol and drugs, but a chance to live a decent life with the possibilities of choices, reaching beyond the concerns of getting enough to eat.[121]

He goes further in offering a system of prioritisation based on a 'greatest good' strategy that allows us to rank environmental degradation significantly below issues that have more economic immediacy. Lomborg claims that to have the best chance of resolving all of the

---

[119]Simon, Julian L. "There is No Crisis of Unsustainability" in Miller, G. Tyler. *Living in the Environment: Principles, Connections, and Solutions,* 10th ed. Toronto: Wadsworth Publishing Company, 1998.

[120]Ibid., page 27.

[121]Lomborg, Bjørn. *The Skeptical Environmentalist: Measuring the Real State of the World*. New York: Cambridge University Press, 2001. Page 328.

problems we are faced with, environmental regulations must be balanced against the good that might be achieved if financial resources were not diverted to environmental causes from other serious issues.

Climate change is, for Lomborg, an excellent example of this way of thinking in action. Based on an estimate of the total cost of global warming of approximately half a trillion dollars per year, he shows that, under scenarios of agressive emissions reductions, the Kyoto Protocol could actually cost the world's economy more money than the effect of global warming itself. Even if the Protocol was established with weak reductions, Lomborg says, "the cost of such a Kyoto pact, just for the US, will be higher than the cost of providing the entire world with clean drinking water and sanitation . . . . [avoiding] 2 million deaths every year and prevent half a billion people [from] becoming seriously ill each year."[122]

The second section of this thesis has argued, however, that the complexity of nature and of our society do not support the confidence Simon and Lomborg have in our ability to assess the consequences of our actions and solve our problems through technological means. To address the unintended consequences of our actions, environmentalist thinkers subscribe to a second argument, based on an ecological worldview, with a set of assumptions that better inform our decision-making. They find the world that we live in to be essentially limited in the amount and quality of resources and other supports for life. Following the teachings of ecology, they point out that the critical limits exist for almost every facet of human life; these limits being a function, more or less, of the health of the living systems taken as a whole. Fundamental connections to natural cycles of energy and materials and to other living things make all life forms interdependent, and so human life depends on the relative health of the environment as a whole.

David Suzuki argues that protection of the biodiveristy upon which the health of the environment depends should be humanity's paramount concern:

> Extinction, of course, is irreversible. And even heroic measures to keep an endangered species going don't stand much of a chance without profound changes in human behaviour and genuine protection of the species' habitat.
>
> The thin layer of biological complexity within the biosphere ensures the productivity and cleanliness of the soil, air and water. Only time and nature safeguard these life-supporting elements and keep them intact. Remarkably, if we pull back and decrease or halt our assault on a given environment, nature can restore itself.[123]

Ecologists point out, however, that since persistent damage to ecosystems may overwhelm the regenerative ability of nature, our social development should protect reserves of biodiversity. The possibility of a sustainable society, therefore, requires a new understanding of our relationship to nature that can balance human interests against the need to accommodate the requirements of a healthy environment.

Understanding these ecological requirements also brings the realisation that there is a strong ethical component integrated into the basic question posed by the need to create a sustainable society: what level of compromise is acceptable to achieve a workable balance

---

[122]Ibid., page 318. The mechanics of this calculation are complicated and debatable. The reader feeling swayed by his logic may also want to keep in mind that similar comparisons could be made for other large global expenditures, such as military spending.

[123]Suzuki, David with Amanda McConnell. *The Sacred Balance: Rediscovering Our Place in Nature*. Toronto: Greystone Books, 1997. Page 153.

between human interests and the viability of nature? The following section will argue that for a number of reasons the ethical component of the compromise offers specific insights into the possibility of resolving the environmental crisis.

To be clear, an ethic is "a pattern or norm or code of conduct actually adopted by a group of people (although, of course, not necessarily always obeyed)."[124] The pattern itself is rarely formalised so discussion about ethics usually involves a fair degree of speculation about the behaviour of groups or communities and the beliefs that they might have. All the same, the ethic shared by a group of people has a real effect on their actions in that the community's beliefs tend to determine the actions and decisions of members of that community.

An ethic or an ethical system therefore contains information that is important in two respects. Not only is it informative to the members of a group of people in that it is a recognisable and relevant code to guide action, but also in the sense that it is a repository of sorts for information about a set of values that the group shares. An ethic may be considered a statement of value, serving to reference, according to some measure, abstract or precise, what the group takes to be in absolute authority. The informal nature of an ethic may mean that these values are not clearly defined but they are at least solid enough to be transmitted from one member of the group to another. For this reason, they, as conceptual items, are open for analysis.

Those that study ethical tendencies point out that the ethics exhibited by most communities are anthropocentric in outlook - a fact reflected in the textbook definition given above. Our society's moral beliefs rarely extend beyond the human domain – beyond the area of human concern. When they do so, they retain a distinctly utilitarian character that is consistent with our anthropocentric outlook. In fact, it is questionable as to whether or not anything other than human concerns and human activities might rationally be considered moral thinking. Even the environment that we create for ourselves has trouble attracting moral attention: as ethicist Warwick Fox points out, "the non-rational, non-sentient, non-living, non-self-organising, non-self-renewing built environment is not generally thought of as being of moral consequence in its own right."[125]

Since traditionally we have not looked at it as an area of concern, the suggestion that we compromise our own activity for the sake of some fairly abstract view of the good of nature, as sustainable thinking asks us to do, is new and unfamiliar ground for ethical thinking. The ethic that is shared by environmentalists and the link to understanding of ecology, as they differ from the traditionally held values represented by the more economic-oriented argument given above, may provide a key to the success of a sustainable society. In fact, the ethical implications of the environmentalist proposals for change may be more significant than the practical solutions that they suggest. For this reason, what is meant by an ethical concern for the natural world requires more detailed treatment.

---

[124]Jones, W.T., et al. ed. *Approaches to Ethics: Representative Selections from Classical Times to the Present.* Toronto: McGraw-Hill Book Company, 1985. Page 1

[125]Fox, Warwick. ed. *Ethics and the Built Environment.* New York: Routledge, 2000. Page 207

The Environmentalist Ethic

The Land Ethic

Aldo Leopold's *Land Ethic* provides an alternate framework for understanding our relationship with the environment that suggests a link between ecological values and a practical environmentalist ethic. Written in 1949, his book, *A Sand County Almanac*, is conceptually and historically linked to the American conservation and romantic naturalist movements. His writing, especially of the land ethic itself, has been a profound influence on the beginning of the environmentalist movement that emerged slightly after his work was published.

Leopold sees the problem of integrating concern for the environment as fundamental. He outlines the basic problem this way: "There is as yet no ethic dealing with man's relation to land and to the animals and plants which grow upon it. Land, like Odysseus' slave-girls, is still property. The land-relation is still strictly economic, entailing privileges but not obligations."[126] In doing so, Leopold makes the connection that has been deemed essential to resolving the environmental crisis. As confirmation of the importance of exploring the link between values and ethics, he notes that: "no important change in ethics was ever accomplished without an internal change in our intellectual emphasis, loyalties, affections, and convictions" (p.247).

The concept of land is key to Leopold's argument. The ‘land' that Leopold refers to contains the animals and plants that we are quite familiar with but also the abiotic elements of the physical environment. Soil, for example, is included, as is water and the flow of energy that connect the biotic to the abiotic cycles. Leopold also introduces the concept of "land as a community" to confirm the understanding of land as interconnected and interdependent. In a second sense, Leopold uses the term community as a metaphor for the land ethic itself. Drawing on the concept of a human community, one that we are all familiar with, he states that the Land ethic "simply enlarges the boundaries of the community to include, soils, waters, plants and animals, or collectively: the land" (239).

For Leopold, the "first principles" of the land ethic are drawn from our scientific knowledge and our experience of nature. An understanding of the basic concepts of ecology, such as the interconnectedness of life, the important role of biodiversity and the cyclical flows of energy and materials, combined with our personal experience of nature to give us "an intense consciousness of land” (261). This ecological consciousness brings with it a feeling of being a participant in a greater process. If the structure of nature is understood and man is seen to be a member of this community, then, for Leopold, a sense of conviction in the individual's responsibility towards this extended community seems natural and inevitable. Once this commitment to nature is held, a strong "ecological conscience," or the

---

[126]Leopold, Aldo. *A Sand County Almanac*: *With Essays on Conservation From Round River*. New York: Ballantine Books, 1966. Page 238.

moral feelings underlying the land ethic, is possible. His summary of the outlook of the land ethic extends these "first principles" to an applied ethic: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (262). This statement, although criticised as being highly unscientific, applies only after the ecological conscience has been achieved. Before seemingly subjective ethical judgements can be made, therefore, a holistic understanding of ecology must be present.

A contemporary defender of Leopold's work, J. Baird Callicott, identifies the 'community' element of the land ethic as a powerful way of explaining the evolution of consciousness with respect to the environment and therefore worthy of further explanation. Callicott is concerned with Leopold's definition of an ethic that appears in the following quotation: "An ethic, ecologically, is a limitation on the freedom of action in the struggle for existence."[127] Leopold, a professor of wildlife management and a forester by training, means 'limitation' in a biological sense. For Callicott this biological definition raises a paradox: "Given the unremitting competitive 'struggle for existence' how could 'limitations on freedom of action' ever have been conserved and spread through a population of Homo sapiens or their evolutionary progenitors?"[128] For the answer, he turns to Darwin and explicates what is roughly a bio-social view of ethics. Under this theory a system of ethics held by a particular community of people is retained and developed as a shared survival strategy. Within the group this has obvious implications of promoting some level of harmonious activity and of protecting against actions towards members that have negative consequences for the well-being of the group. How the group defines its community is the most important element for Leopold's view. Membership in the community is the determining factor of ethical significance. Darwin had argued that the relevant community was based on family connections, based on well-known ties that are common among all mammals. This basis gives, for humans, the possibility of expansion as other, larger groups are acknowledged to be part of the same community. In a civilised setting, society helps to form the definition of these groups but the sense of community rests on the basic sentiments that Darwin identified in familial bonds.

Callicott follows Leopold through a generalisation on Darwin's theory which leads to the expectation that: "the scope and specific content of ethics will reflect both the perceived boundaries and the actual structure or organization of a cooperative community or society."[129] This simple correlation, Callicott claims, aside from being a useful analytical tool, allows for "the anticipation of future moral development (including, ultimately, the land ethic)."[130] Leopold, in Callicott's view, has therefore an acceptable base from which to make the claim that the land ethic carries with it some form of inevitability. Callicott points out that we are in the midst of a change from a sense of human community defined by nationalist sentiments to one that embraces the global extents of humanity. From this 'global village' it is not such a stretch to the inclusion of other elements of the global ecosystem as

---

[127]Callicott, Baird J. “The Conceptual Foundations of the Land Ethic” in Zimmerman, Michael E., et al., eds. *Environmental Philosophy: From Animal Rights to Radical Ecology*. 2nd Ed. New Jersey: Prentice-Hall Inc., 1998. Page 103.

[128]Ibid., page 103.

[129]Ibid., page 105.

[130]Ibid., page 105.

ethically significant - a position that is supported by the ecologists' view of biological interdependence. The bio-social view of ethics has the advantage, therefore, of being connected to biological imperatives in human nature which gives it a strong and comprehensible conceptual base.

Deep Ecology and The Value of Nature

The land ethic is at once so understandable and so foreign to our current relationship with nature that it's influence has had a divisive effect on environmentalist thinking. The following description of the deep ecological movement lead by eco-philosopher Arne Naess outlines important differences within the environmentalist movement in the way that value is attached to nature. Arne Naess and his collaborator George Sessions chose the term 'deep ecological movement' to reflect the informality of belief that was noticed by our definition of ethics above. The term 'movement', they felt, appropriately captures the participatory nature of the environmentalist conviction while still acknowledging the importance of the beliefs that are held in common. The 'deep' ecological approach quite obviously sets itself apart from a 'shallow' ecology.

For Naess, the 'deep' approach seeks to incorporate the suggested ethical change by building the link between belief in first principles and an ethic that would truly reflect those beliefs. Central to this process is the rigorous questioning of society's views about the environment and the reasons that we give to justify our actions. According to Naess, the 'shallow' approach either "stops before reaching fundamentals, or it jumps from the ultimate to the particular"[131] and therefore fails to establish what he considers to be the critical link. Beyond this most important point, there are other significant differences. The shallow view tends to be anthropocentric in orientation. Shallow ecologists are concerned with modifying the structure and technologies of our existing society to correct the damage that we are causing to the environment. They do find a certain level of damage to other elements of the environment acceptable at least in the short term and in so far as it allows other human activity to proceed. This strongly recalls Hajer's definition of the ecological modernisation paradigm and the argument put forward by Bjørn Lomborg.

The lack of focus on first principles creates, in Naess' opinion, a movement away from the shared ethic: "the shallow environmental approach, by focusing almost exclusively on the technical aspects of environmental problems, tends to make the public more passive and disinterested in the more crucial non-technical, lifestyle-related, environmental issues."[132] The shallow approach does employ a deeper ethic strategically but does so, Naess warns, with further rise of increasing general apathy to environmentalist teaching. Naess refers to the text of the World Conservation Strategy, where it states that "A new ethic, embracing plants and animals as well as people, is required for human societies to live

[131]Naess, Arne. "The Deep Ecological Movement: Some Philosophical Aspects" in Zimmerman, Michael E., et al., ed. *Environmental Philosophy: From Animal Rights to Radical Ecology.* 2nd Ed. New Jersey: Prentice-Hall Inc., 1998. Page 206.

[132]Ibid., page 203.

in harmony with the natural world on which they depend for survival and well-being."[133] Noting that the author is aware of the importance of such an ethic, Naess points out that "such an ethic would surely be more effective if it were acted upon by people who believe in its validity, rather than merely its usefulness."[134]

Personal commitment is at the heart of the deep approach. Central to this commitment is the process of rigorously questioning our views about the environment and the reasons we give to justify our actions. While each person's actual first principles may vary, Naess acknowledges that the world's major religions, especially Christianity, Buddhism and Taoism, are common sources of these beliefs. Since religious views remain inaccessible to many, the deep ecologists are intent upon opening pathways for understanding that do not depend on a theistic worldview. Some critics have used this appeal to religious first principles to claim that deep ecology lacks the rational base of a proper ethical theory. Further, critics note a tendency among deep ecologists to be critical of the rational arguments posed by shallow ecologists, giving the general impression that those following the deep ecological movement are interested in something other than rational explanation.

Naess defends this practice by claiming that although they are critical of reason as a sole means of justifying action with regard to the environment, deep ecologists support rational constructions that follow from the fundamental positions that the process of deep inquiry reveals. This process will, it is hoped, clarify rational arguments that do not logically follow from first principles, and thus remediate the problems that these policies have caused. It will also serve to demystify first principles that are held in common by many people around the globe but have not adequately been expressed by either our lifestyles or our policies.

The deep ecologists' cautious approach towards solutions that seem reasonable to most is consistent with the observation made in Part Two of this thesis that the relative complexity of both the natural world and our own society put us at a disadvantage when certainty is required. The possibility that what we perceive to be an environmentally responsible action may, in fact, be otherwise. The deep questioning approach aims to subject our worldview to a higher degree of scrutiny in an effort to identify mistaken assumptions that have unintended and possibly destructive consequences for our society and for the natural world.

The key to the deep approach is the willingness to question one's beliefs in an attempt to identify the first principles upon which rational arguments can be based. At a social level, the deep ecological movement takes as its role the deep questioning of statements of intention that are meant to be shared generally. Put quite simply Naess claims that "if an environmentally oriented policy decision is not linked to intrinsic values or ultimates, then its rationality has yet to be determined."[135] Naess sees the possibility for lasting change through the process of deeply questioning both personally and socially held

---

[133]Naess, *op. cit.*, page 195. He references the International Union for the Conservation of Nature and Natural Resources (IUCN), *World Conservation Strategy: Living Resource Conservation for Sustainable Development* (Gland, Switzerland, 1980), section 13 ("Building Support for Conservation"), but does not mention the page.

[134]Ibid., page 195.

[135]Ibid., page 206.

convictions. The result necessarily is a higher degree of awareness of the value we place in the natural environment and how we perceive our relation to it. Once these first principles are established, an environmentalist ethic becomes more than a rational consequence: it will naturally develop through general commitment that is as strong as each person's conviction.

The deep ecological movement is often but not exclusively associated with the principle that nature should be considered intrinsically valuable. That the natural world is assigned value based on the role that it plays within a socially determined framework of values is quite easy to accept - particularly for those who are more economically-minded. That nature is the source of value and can be considered morally significant in its own right is more problematic. It is therefore important to be clear about the difference between the intrinsic value of nature and the more commonly understood instrumental value attributed to the natural world. Instrumental value can be described as "use-value." For example, when we talk about the importance or value of prime agricultural land we mean that it is valuable to us in the sense that it is a necessary part of our food production network and therefore has specific use to us. The land's value is attributed based on the way that it fulfills the role that we have given it. That value is maintained as long as the richness of the soil supports crop growth but the value decreases as its capacity to produce food diminishes. We might see this function as supporting our survival or we might see it in economic terms. Either way, its value depends on what we are able to draw out of it; to what extent it is a resource.

Another example indicates the complexity that can arise from the instrumental view in a less clear situation. In Canada, we place value on the existence of large mammals in our wilderness. A healthy moose population, for example, is important for a variety of reasons. One might focus on the population as an indicator of ecosystem health, as a symbol of untouched wilderness; this image of the wild might be linked to recreational or tourist activities that are valued socially for other reasons. For some, value is also derived from the hunting, consumption or commercial sale of the moose meat. For these people, a moose population that remains healthy over the long term has economic value. For urbanites escaping to the Canadian wild, the sighting of a large mammal in a natural habitat may crystallise in memory a rare experience of nature. The sighting of a moose in a natural landscape has value that we would like to think is separate from other socially generated values but actually conforms to our aesthetic preferences. These represent a view of our desired relationship with nature - not necessarily the relationship that actually exists but a preferred one that better serves our purposes.

The view that nature has intrinsic value is somewhat foreign to the above ways of explaining the value of nature and is frequently misunderstood. It requires that we set aside our anthropocentric conceptual framework and attempt to understand nature as a self-referential, self-perpetuating process. Nature's intrinsic value, or its value in itself, is according to Arne Naess, "independent of the usefulness of the non-human world for human purposes."[136] In this view, the value of nature is established before human interests are considered.

As noted above, deep ecologists recognise that the idea of the intrinsic value of nature fits into the worldview offered by some religions. In Western religions, such as Christianity, Islam and Judaism, the natural world, as a creation of God, would seem to have the potential to fall into a value structure that is, by definition, beyond human purposes. The intrinsic value of God's creation and the entailed respect is changed, however, by the specific

---

[136]Ibid., page 196.

interpretation of man's relation to the natural world (such as steward, master, etc.), which is established with the same divine authority. In Eastern religions, such as Hinduism or Buddhism, nature and natural processes and the continuum that they form are divine in origin. All of these faiths have, as one would expect, a fairly specific ethical code that involves a level of everyday instructions that could serve to inform our relation to nature.

As has been noted previously, the connection between statements of value, such as the intrinsic value of nature, and an ethical code that would have a real effect on our society is determined by belief. To be widely accepted, a general ethic - the one that is required by deep ecologists and the environmentalist movement - needs, apparently, a wider ground for establishing belief than what is offered by the religious views described above.

Criticism of the Ecocentrist Position

Philosopher Bruce H. King reacts to the generality with which Naess and other deep ecologists introduce key concepts by arguing for the importance of contextualisation in environmentalist ethics. King claims that any ethical theory must both be valid from a philosophical point of view but also be understandable in a way that makes it useful to people in everyday situations. Ethicists must strive to make arguments that are, in the end, effective and this means not relying on abstract concepts to validate their positions. He goes further, claiming that:

> "to be intelligible, the argument must link the concepts used with the existing web of beliefs, narrative tendencies, and imaginative resources of the people to whom it is addressed. As these will vary from group to group, the argument's force relies, essentially, not on a common power of reason or logic shared by all, but upon the contextual project of knowing and addressing the particular imaginative capacities of each audience."[137]

The belief that ethical arguments are in every case framed by existing conceptual framework is at the heart of the contextualist position. The elements that philosophers must address themselves to, when taken as a whole, are the culture of the group of people in question.

In most environmentalist arguments, King sees three major problems with respect to the necessary context. First, it is customary to address environmentalist arguments to an abstract audience. Second, arguments are made from the position of an abstract speaker. Third, there is a failure to address the imaginative capacities of the audience, which make "rational argument possible and persuasive."[138] In total these amount to an avoidance of the context that King regards as crucial. This must in part be due to the need for environmentalist positions to be broadcast to virtually every human community on the planet. In doing so, King points out, key differences between people are missed and the content of the argument, therefore, is not effectively delivered. We have already seen the most obvious example of this in the earlier description of the North/South debate in the global discourse which led to sustainable development. In this case, the relative need for

---

[137]King, Bruce H. "Narrative, Imagination and Environmental Ethics" in *Ethics and the Environment* 4(1): 23-38. Page 28.

[138]Ibid., page 25.

economic development differed greatly between the so-called developed countries of the North and the developing countries of the South. Various calls for limitation on the type of development that would be acceptable were strongly rejected as unfair by the Southern group of countries. Here, a clear cut ethical argument – that one should act a certain way for the benefit of a larger group – failed to adequately address the reality with which the Southern countries are faced.

King points to more specific concepts in environmentalist arguments. He considers the intrinsic value of nature to be a "particularly opaque concept."[139] The concept of intrinsic value itself, he claims, was fundamental in establishing the view that humans are the rightfully dominant forms of life. The intrinsic value of human life, for example, has been defined by contrasting human characteristics, such as our intelligence, our speech, and our use of reason, against the characteristics and abilities of other living things. When ecocentric arguments extend this concept to the natural world, King feels that the confusion created is understandable. Without an argument that attempts to resolve this very real conceptual paradox, the suggestion that nature might be intrinsically valuable will not be intelligible to our society. King suggests that: "We might avoid this by embedding our understanding of holistic value in narratives of human life that flesh out visions of how humans should interact with nonhuman nature."[140] In short, we need to have ethical arguments that spell out the place of humans in the world.

To make intelligible ethical arguments about the environment, King argues that we must understand more about the way that beliefs are held in the collective imagination of our culture. For an approach to this, he directs us to a book called *Metaphors We Live By* written by linguists George Lakoff and Mark Johnson. These authors make the case that metaphors are a fundamental construction for meaning in our language and so by extension, form the basic structure of our conceptual framework. King draws two examples of metaphors from Lakoff and Johnson that are frequently used in common discourse: nature as a resource, and nature as a woman. By association with other ways in which the terms resource and woman are used, Lakoff and Johnson suggest that we must view nature as something that can be owned and exploited. For environmentalists making ethical arguments, King argues that there are important consequences:

> The ecocentric argument asks us to see nature as a domain with its own directions, conditions of well-being, and value. Rather than seeing nature as a tool for human use, it asks us to deal with it respectfully as an independent agent. If Lakoff and Johnson are right that our values are likely to be "consistent with the metaphorical system" of our language, then the ecocentrist is operating in a linguistic and moral context that is hostile to his or her intentions.[141]

In making arguments that cast aside conventional ethical rules, King notes that environmentalists must also work against social forces that actively oppose new systems.

To respect the requirement laid out by the contextualist view of ethical argumentation, King feels that there are two options for environmentalists. These options are based on whether the objective is immediate results or longer-term social change. In the

---

[139] *Ibid.*, page 28.

[140] *Ibid.*, page 29.

[141] *Ibid.*, page 33.

former case, environmentalists must make their arguments in a narrative form that picks up the existing cultural context: "writing to make sense within the context of the ongoing narratives or our audience."[142] Once so engaged, the writer may focus on issues that bring concern for the environment to the forefront and from there, evaluate these issues according to existing value structures. The theories of Lomborg, Hawken, Lovins, Simon, and McDonough and Braungart examined in previous sections all show a careful attention to the economic concerns that dominate our society's thinking. In the case where significant long-term change is desired, there would be a need to challenge the structures that make up the existing context directly. Writers that take this approach might be seen to be writing a 'fictional' narrative describing a future social state that does not yet correspond to the way that people live. In both cases, ethical arguments must address more fully the context that exists for both narrator and audience. If successful, King sees the possibility for a fundamental shift in awareness: "Such a philosophical approach may not lead to finality, closure, and rational certainty, but it recognizes and is accountable to the particulars of moral situations and the plurality of the author and audience standpoints contained in environmental narratives."[143] These characteristics go a great distance in establishing the intelligibility that is required for forceful ethical arguments about the environment desired by ecocentrist thinkers like Arne Naess.

Developing an Appropriate Context for Environmentalist Ethics

King argues that contextualisation is an essential element of persuasive ethical arguments. In establishing the appropriate context for environmentalist ethics, there must naturally be some consideration given to the signs that can be read back from the environment - that is, our discourse must reflect social realities but also the external requirements of the natural world. Information from such external sources, of course, can be treated to an interpretation that is only as objective as our scientific mode of investigation will allow. Insofar as the reaction of the environment differs from our expectations, a refinement of our existential premises is possible. Without this consideration, ethical arguments about the environment are incomplete.

Feedback from the environment in the form of unwanted damage and consequences for our society must be given the same consideration that any ethical discussion would integrate feedback from the stakeholder community. The realisation that existing conceptual structures in our society are inadequate because they don't accommodate new information about the environment is significant. New factual information is subject to some form of categorisation as it enters our collective body of knowledge. Its meaning may be argued about but the feedback from the environment is not entirely open to debate. There may not be understanding or agreement on the scope of the damage that is being caused but very few disagree that the way our society lives impacts the environment in unexpected and possibly very negative ways. Because ecologists know that the health of our environment is connected to our own health and welfare, society must accept this information as a valid (if vague) indication of the real state of the environment. It is a reading of this state that must form some part of the context for decision-making about the environmental crisis. It is in

---

[142] *Ibid.*, page 34.

[143] *Ibid.*, page 37.

this sense that the context for ethical argumentation sought after by King must be expanded.

Environmentalists should not simply be concerned with forming rhetorical connections to culture, regardless of how critical they are for the intelligibility of ethical statements. The argument could easily be made that the arguments that suit themselves to our economic worldview are doing exactly what King has suggested: they are forming an understandable context for a set of beliefs about the world that, in this case, justify and support an anthropocentric ethical outlook. However, a consistent criticism of sustainable development initiatives in Section Two of this thesis emphasised the fact that the economic worldview frequently leads to unintended consequences in the environment. This implies that our ethical arguments should not be adjusted to the economic mode of valuation. Other ways must be found. Fortunately, signs of the damage that our society has caused in the environment can be found when looked for. While not necessarily moving us any farther ahead in our evaluation of our own activity, these signs do form a record of instances where our expectations about how the world works differ from the actual way that the environment responds. In this sense, the feedback information is a parallel narrative – a story of trial and error – that would be overlooked as an important contextual element for our existence only at great folly.

For these reasons, King's argument must be re-evaluated. Where he insinuates that the choice of appropriate context be made by the individual ethicist, a more specific point can be made: what is known about the environment helps to clarify this choice. If some estimation of the natural world is taken as part of the context and the signs read tell us that our current relationship with the environment is not working, then there are strong reasons to think that a narrative for change should be written. King warned against such forecasting of ethical change as fictional narratives and described them as "stories of lives that no one is leading."[144] But by including the state of the natural world as a requirement of the appropriate context, this thinking can be turned on end: ethical narratives that accurately reflect feedback from the environment and propose a change to the way that value is assigned to the world, might *prevent us* from adhering to stories of lives that no one should be leading.

Is an Environmentalist Ethic an Effective Solution to the Environmental Crisis?

As King points out, an ethic effectively transmits cultural values if it is rendered intelligible and relevant by an appropriate context. It has been suggested that real credibility may come from the scientific understanding of the world. In addition, as Leopold suggests, knowledge of how the world works can come from a direct personal experience of nature. For Naess, an environmentalist ethic may stem from an understanding of the intrinsic value of the natural world, which again, may have some basis in nature.

The possibility of a widely held environmentalist ethic is encouraging. Since an ethical structure transfers value information from person-to-person within a community through ideal behavioural guidelines (that could be construed as a model), an environmentalist ethic could fulfil the need in sustainable development theory for a universally understandable image of a sustainable society. In fact, it would present this image in a very powerful and concrete way. Since it is also founded on scientific principles

---

[144] *Ibid.*, page 33.

that purport to describe ecology generally, not of a place or region exclusively, the environmentalist ethic is somewhat independent of cultural context. What is intriguing about the level of objectivity that is contained in this idea is that the ethic would, by nature of its incomplete fit with any particular culture, have to undergo a partial translation into every culture, but would never wholly lose the ecocentric values that it carries.

The specialisation of our society was identified by Amory Lovins as a hindrance to social change for the technological and economic solutions reviewed in section two. The transmission of ecological values can effectively reach through these divisions to decision-makers at many different levels. Having the associated awareness of environmental issues allows each specialist to make individual judgements to suit unique circumstances - similar in effect to a professional code of ethics which is intended to furnish each professional with consistent information about how society expects them to act. McDonough and Braungart encourage industry to behave in exactly this way by adapting their principles of eco-effectiveness:

> *Signal your intention*. Commit to a new paradigm, rather than to an incremental improvement of the old. For example, when a business leader says, "We are going to make a solar-powered product," that is a signal strong enough for everyone to understand the company's positive intentions, ... Employees "down on the ground" need to have this vision in place at the top, especially as they encounter resistance within the company.[145]

The principles of eco-effectiveness, as was discussed in section two, are based on a very adept analysis of the environmental crisis and the need for social change.

An environmentalist ethic seems then to be able to make a positive contribution towards securing effective action on environmental issues. There remains, however, an important issue: it has been argued by Naess and King that an ecocentric ethic requires an intelligible and relevant context. Above, reasons have been given to support an awareness of ecological principles as the appropriate choice. But this argument depends on the truth of what we learn from our scientific study–that is, in order to justify changing our society, we must be reasonably sure that our information about the environment is not wrong. In the second section of this thesis, the same requirement was applied to technical solutions based on the same scientific information and it should, therefore, be applied here.

Scientific Uncertainty and the Appropriate Context for the Environmental Crisis

Our scientific understanding is open to doubt as to whether enough information can be provided to help us determine what we should or should not do. The level of detail needed to understand the complex interactions between our society and the natural world further complicates our ability to effectively comprehend the state of the world. For the present uncertainty is, therefore, a fundamental condition of our total knowledge of the environment.

Even the knowledge that we hold with certainty is open to some degree of doubt - if not in the facts themselves, then at least in the way that they are organised. In *The Structure*

---

[145]McDonough, William and Michael Braungart. *Cradle to Cradle: Remaking the Way We Make Things.* New York: North Point Press, 2002. Page 182.

of Scientific Revolutions, Thomas Kuhn provides a valuable insight into the structure of the theories that gather facts into useable explanations. Kuhn expands the traditional understanding of scientific development to account for new discoveries that have a revolutionary effect on accepted maxims. Typically, Kuhn claims, the formation of an explanatory theory is followed by intense and focussed study of the details for which that the theory provides some sense of meaning. The work on isolated facts is guided by the ruling theory, which, in an effort to convincingly explain information in a broader context, leaps ahead of the evidence. Normal scientific work then, is predisposed to organisation according to a paradigm of thought.

Kuhn points out that scientific theories are in the end only theories: inevitably normal scientific work progresses to the point where the assembled evidence forms by itself an objective reflection on the accuracy of the theoretical paradigm. The facts at this point either correspond perfectly to theory or, more commonly, exhibit traces of self-organisation that call for a re-thinking of the overall assembly of information. So powerful is the focussing effect of the original theory, Kuhn says, that scientists often keep to their familiar explanations even though obvious contradictions exist.

The second arm of scientific thought is exploratory science. Scientists thinking openly enough about contradictions in their work fall upon new ways of organising information. Importantly, the re-organisation does not question the facts themselves - normal scientific method essentially ensures that the scientist will remove any doubt about the facts before accepting contradictions in the way that they are organised - instead, the structure of the information is shuffled in such a way that the contradictions are resolved. At times exploratory science has a revolutionary effect on the paradigm followed by an entire field of study or perhaps even drastically revises our global understanding.

Kuhn's work demonstrates a deeply conservative trend in the framework that organises our scientific knowledge of the world. The uncertainty mentioned above stems from the tendency of historically held views to overshadow and even overwhelm theories that provide a more accurate impression of the world but lack the critical support given by years of normal scientific investigation. The science of chemistry went through this stage and the new science of ecology, which has offered so much to our understanding of the environmental crisis, is currently itself in paradigm change. The unexpected damage to the environment fuels considered criticisms of ecologically-informed environmentalists, which cast doubt on the way that scientific information is presented to the decision-making members of society. Knowing the volatile nature of governing theories, Kuhn charges that scientific information is presented with a false certainty.[146]

Scientists are not prone to panic when faced with the fact that the current paradigm of thought will almost certainly be replaced with another more accurate explanation. The uncertainty caused by our basic position of having to live by one explanation of the world while looking for a better one is overcome by falling back on our traditional understanding. Kuhn gives many examples of where this is and has been true within the scientific structure of knowledge. In the shift from paradigm to paradigm, there is always a component of our global understanding lingering from a historical circumstance, able to fill the void between threads of knowledge. The confident certainty with which science presents answers obscures

---

[146]Kuhn began his thinking about these issues through review of texts for an introductory course in the sciences. He began to wonder about the effect of preparing the students' conceptual framework solely through out of date theories.

the fact that belief, opinion and even superstition all have a place in our complete understanding of the world.[147] In this way, the scientific community is never fully without some level of explanation for the natural phenomena that it studies and our society as a whole is able to overcome the uncertainty that would exist if we had to depend on science alone to provide a complete existential grounding.

Our perception of the world, which we know is crucial to finding a solution to the environmental crisis, cannot be described with complete confidence by even our most advanced scientific knowledge. In addition to our scientific understanding, however, we have a deep cultural history that prejudices our view of the world around us and allows us to know what science cannot yet grasp. We have then a more precise definition of the appropriate context for understanding the environmental crisis. There are two critical components: how we perceive the world, and how we perceive our relationship to it. Of these two, science can answer the first, can at least address the second. The rest of the information that is required must be presented by cultural interpretation. The fulfilment of an appropriate context for the environmental crisis requires, therefore, a cultural structure to bridge this gap.

The Cultural Bridge

In past cultures that were not dominated by rational thinking, myths provided global explanations that pervaded all aspects of society. By our modern standards historical myths are irrational and inconsistent. But the consistency with which the myths presented an impression of the world back to the culture that created them attests to both the flexibility of the human imagination and the powerful way in which these stories can provide fundamentally important existential answers. At least in part, we must consider mythological thinking to contribute to the way that we understand the world. It makes a major contribution to the way that we understand our relationship to the world through stories that represent our culture.

We are generally familiar with the idea that pre-literate cultures think mythologically. Levi-Strauss describes this as the process "to reach by the shortest possible means a general understanding of the universe - and not only a general but a total understanding."[148] The total understanding achieved through mythology, however, is an illusion. Levi-Strauss points out that a mythological explanation cannot account for the way that the world really is - it is not rigorous or systematic in gathering and structuring information - but myths are very good at accommodating seemingly irreconcilable but fundamentally important information. The illusion that humans can understand the universe and their place in it is very important, crucial even, to this ability to survive. This illusion is vigorously defended.

---

[147]John Raulston Saul traces the origins of the very strenuous version of truth now required by science to the point in Western cultural history where Voltaire and his contemporaries made use of rational thinking as a weapon against the superstition that supported the absolute authority of (and capricious use of power by) the monarchy and the church. Saul claims that the militant character of rational thought was also acquired at this time. (Saul, John Ralston. *Voltaire's Bastards: The Dictatorship of Reason in the West.* Toronto: Penguin Books, 1993.)

[148]Lévi-Strauss, Claude. *Myth and Meaning.* Toronto: University of Toronto Press, 1978. Page 17.

The explanations of the world that are passed on to us by formal science are the familiar foundations of our worldview. The standards that are set by the scientific endeavour for the identification and classification of knowledge mean that science is not as flexible as mythological explanations. Science cannot stretch to cover the ground between bits of knowledge as easily as mythologies that reach to develop full solutions using whatever information is at hand. Science is reductionist in approach, breaking phenomena into isolated specimens of knowledge not intrinsically related to anything else. Consequentially, as Levi-Strauss points out: "There will always be a gap between the answer science is able to give us and the new question which this answer will raise."[149]

What both myths and science show is a durability of beliefs and the structures that form our worldview. The tendency to arrive at a "best fit" explanation that takes the form of a story would seem to be a common element to human beliefs of different types. This durability is transferred to the value system that is built upon them. Our ethical beliefs, naturally, are also influenced by the tendency of our central beliefs to remain intact throughout time. One part of the argument is that because of the chain of events to be followed from belief to worldview to value-statements to ethics, we should look for change at the level of beliefs. Another part is that because these beliefs have a tendency to remain intact over time, then the goal of a sustainable society - at least the implied durability - can also be satisfied by change at this level. The final point that is related to the way that these beliefs are durable is the fact that they are explicitly geared to deal with situations that involve more information than we can easily assume into a coherent form - that is, they are a mechanism to allow us to function in a complex world.

Nature myths are the beliefs that describe our relationship to the physical environment. They allow us to respond to that which is consistent in the world and at the same time, provide us with a way of dealing with inconsistencies. Such a structure is a fundamental component of a sustainable solution that is characterised by the lack of information that we have about the natural world, our connections to it and the repercussions of our activities. Both the complexity of our own society and the world around us are resolved relative to the fundamental beliefs that we have. There may, fortunately, also be many different ways that this can happen. This, to a certain extent is a necessary role of art and culture - to explore the various possible solutions that our worldview offers.

Of all our shared values that serve to inform our ethical beliefs about the natural world, there is something important about the values that are expressed by mythologies about nature. Our relationship with our immediate environs is the point at which practical concerns for our survival and existential concerns overlap. Nature myths are part of a very active process of interpretation in which the otherwise random events in the nature are given significance and through which the operation of the natural world is tied into our society. Our understanding of nature is formed by the crossing of survival concerns and the world view expressed by cultural mythologies. Accordingly, we find that mythologies about nature contain a mix of culturally generated information in the form of explanations, and information about the physical environment itself.

The cultural structure that holds these myths is effective at transferring both types of knowledge from one generation to the next. Physical elements of this cultural memory function are also mixed. Some being artifacts made to support or act out the myth - as is common in myths that are not explicitly nature based. Others are elements of the natural

---

[149]Ibid., page 17

domain itself, having been made symbols to represent both survival and existential knowledge.

With respect to our understanding of our relationship with the world, the acts of making artifacts and of making modifications to the environment we live in, go hand in hand with the necessary interpretation of our role in the world. Here is a synthesis of natural limitations and constraints placed on our culture by climate and geography, with the needs and wants that are generated by our social activity. In the actual material that is available within our cultural history we see a strong connection to place - specific beliefs reflecting specific geography, climate and ecology, all of which informs and guides our perception of our role in the world. Imaginative mythological thinking is what accomplishes the act of interpretation that may bridge the gap left in our scientific knowledge and determine our relationship to the world and the environmental values that we hold.

A Culture of Effective Environmentalist Action

This thesis has argued that to ensure that the appropriate context for an environmentalist ethic is achieved, several conditions must be addressed. First, our *understanding of the world* needs to be broadened to include the ecological teachings that can explain the environmental crisis–a new understanding of the world in these terms contradicts some of our assumptions about how the world works and is therefore likely to be uncomfortable. Second, our *place in the world* needs to be examined in terms of ecological principles. Third, we need to develop a new sense of what *our relationship with the world* should be, and in doing so discover how we ought to act with a higher degree of certainty.

There are specific tasks to accomplish these goals. The integration of ecological principles into our understanding of the world requires active interpretation of both our social needs and the requirements of the natural world. Having a developed ecological awareness that supports a view of nature as intrinsically valuable is a prerequisite for a partially objective analysis of the biosphere's requirements. The needs of society, then, can be reinterpreted in light of our deeper scientific grasp of limits posed by the natural world. In this task there is a profound balance to be achieved between human preferences and the requirements of a healthy biosphere. Although we will not escape our anthropocentric bias, a sufficiently internalised ecocentric view will help us appreciate the real constraints on our activity.

The balanced relationship with the world must be expressed. The environmentalist ethic is a crucial part of this task but it must also lead to concrete social examples on several levels:

New stories must be developed that explain the balance with ecology. Imagination needs to help explanations evolve that contribute to a new worldview. Without engaging in fiction, connections can be made that describe the extensions of human life into the natural world, providing recognition of an ecological perspective, or narratives for change. The city of Toronto, for example, *is* located on Lake Ontario. The Deep Lake Water Cooling project *is* a man-made circulatory system to regulate temperature by directly engaging the Lake. Water *has* cut ravines through the landscape of the city that now influences the urban form, marks the inhabitants' sense of space, and provides for unique incursions of wildlife into the city. These aspects of the city relationship with the water cycle are raw materials to be drawn upon. With these, imagination informed by science can express a vision of a sustainable

society in terms understandable to our existing worldview.

New ecological dimensions must be defined for existing social roles. This requirement aids in the establishment of an ethic by including a sense of environmental responsibility in every activity. The ethic is further supported and developed by practical knowledge that deepens our understanding of ecological theory. For example, in order to understand the long-term and delicate natural processes that create soil, we can rely, in part, on our scientific knowledge. David Suzuki explains the importance of what is difficult to observe within healthy, productive soil:

> The inhabitants of the soil play many different parts in its cycle of fertility. . . . They fix crucial elements in forms that plants can use, and they interact with plants in many of the processes or growth. Worms, ants and termites, springtails, protozoa, fungi, bacteria–from the visible to the unimaginably minute, they are part of the crucial functions performed by the soil of the planet. More than just the substrate for creating growth, the soil is Earth's primary filter, cleansing and recycling water and decaying material; it is also a major component of the planet's water-storage and water-cycling processes.[150]

In order to apply this knowledge, however, it must be wed to the experience of agricultural and forestry practice. Understanding this connection allows us to be able to see farmers as caretakers of the soil - acting to prevent soil erosion and building a nutrient base for sustainable agriculture - in addition to their well understood social role of providing food.

New artifacts are needed that reflect a sustainable relationship with nature. The physical objects that we make help give meaning to our environment. They also have a persistent effect on our activity both because of their intended and possible functionality, and because they are a repository for information that is literally designed into the object. Architecture is a clear example of this expression: meaning is established through building that has the capacity to express a way of living in the world. Philosopher Karsten Harries ponders this point:

> Consider the way in which a Greek temple or a medieval cathedral gathers the surrounding landscape into a region which lets men dwell together on the earth instead of leaving them to drift across it as strangers. From the very beginning architecture has had an *ethical function*, helping to articulate and even to establish man's *ethos*–our use of the word "edify" still hints at the relationship between building and ethics. The architecture of the baroque was perhaps the last to preserve this ethical function; the past two centuries have lost sight of it.[151]

Architects have designed many modern buildings that establish an ethos, or characteristic spirit, *contrary* to the ecological limitations that have been explored in this thesis. Buildings

---

[150]Suzuki, David with Amanda McConnell. *The Sacred Balance: Rediscovering Our Place in Nature*. Toronto: Greystone Books, 1997. Page 81.

[151]Harries, Karsten. "The Ethical Function of Architecture" in Nesbitt, Kate ed. *Theorizing A New Agenda For Architecture: An Anthology of Architectural Theory 1965-1995*. New York: Princeton University Press, 1996. Page 395.

that do not seek to edify, but simply provide for a life engaged with the natural world and respectful of its limits can contribute a durable image of a sustainable society.

Both the environmental values, the ecological dimension of social roles and the working images of a sustainable society are active, changing elements of an environmentalist culture that can support and develop the environmentalist ethic. This culture must be developed as a whole through the concerted efforts of all parts of society. In particular the interpretation required at various key points will need both the specialised thinking that our society excels at, as well as the more generalist thinking that is in some danger of being marginalised. The casual consensus that culture is able to achieve should be seen as fundamentally important to this act of interpretation. For this reason what is suggested here is not the same as policies or theories but instead aims at a comprehensive action that is the result of many, mutually supportive efforts. These conditions in place, we can then expect effective action through a series of practical proposals suited to society and to the world, *and* be reasonably assured that we are on the path to resolving the crisis that we have caused in our environment.

Epilogue: a Statement of Architecture's Role in the Environmentalist Movement

This thesis has argued that the search for a sustainable society can only be accomplished with an adjustment to the way that we see ourselves in relation to the physical environment and the natural world. Our values, institutions and activities will need to be adjusted accordingly to recognise the interconnection of life and our dependance on other living things. This will be accomplished successfully, it seems, by a change in the ethics which guide our actions. The enlargement of the sense of community to incorporate all living things as morally significant and the close attention to our symbolic associations invested in the physical world point to a cultural solution rather than a technical one. The need is clear for a re-awakening of environmental values through a renewed set of symbols, and a cultural change through an ethical system that accommodates care for the environment and places new importance on the form and cultural associations of the built environment. All of this is gathered under the idea of a new culture of environmentalism. Architects and other specialists entrusted with the creation and maintenance of a meaningful environment must have some important role to play in the formation of this new culture.

Nothing in the line of reasoning above (other than, perhaps its attention to ethics as the effective medium for change) is new to the international discourse on the environmental crisis. Throughout the research for this thesis historically significant works were repeatedly found to contain solid examples of action that would lead in the direction that has been argued for. The root causes of both the environmental crisis and the global disagreement on the solution have been effectively illustrated in many other works. As surprising as the clarity of these voices was, given the current confusion, the absolute regularity with which the message voiced by these works has been overlooked and then rediscovered or reformulated after decades or centuries had past. Curiously, the fact that we have, on more than one occasion, satisfied in theory the requirements that this thesis has used to determine the effectiveness and appropriateness of proposed solutions, has rarely been reason enough to act as a society.

The Environmental Impact of Architecture

It would seem that since the environmental problem deals with our use of the physical environment, then architecture would be part of the solution. It would also seem to be the case that since the solution we have discussed deals with the attitude of our society towards the environment, then architects, who are thought to minister to this relationship, may have a role in the solution almost by definition. This way of thinking is certainly at the base of an article by Edward Mazria entitled "It's the Architecture, Stupid!"[152] Mazria, an architect in Santa Fe, New Mexico, looks specifically at the atmospheric and energy components of global warming and argues that a wide view of these issues implicates architects directly. He notes, as we have, that solutions of limited scope do not seem to be making an impact. When the larger picture is considered, he finds that "It's architecture – residential, commercial and industrial buildings and their construction materials – that account for nearly half of all the energy used in this country each year" (49). Traditional conceptual drawings of energy consumption show categories like industry, residential, commercial and transportation. Each of these includes tallies of energy for operations of physical plants and energy for processes. When the energy use relating to construction and maintenance of buildings is extracted to form a new category called 'architecture,' the fact that roughly half of our energy consumption relates to buildings and the built environment becomes clear. Since the physical environment that we create is generally made to be durable, says Mazria, its "inertia has a major impact on future energy use and emissions patterns" (50). The influence of architects in the creation of the built environment is therefore both extensive and long lasting.[153]

Encouragingly, Mazria points out that the obstacles to achieving change within the design professions are not technical ones. Many of the arguments that he makes to this point reflect the observations of the Factor Four school of thought that substantial room for improvement exists in the gap between current practice and the best known practice. The main obstacle is the fact that "architecture has become estranged and totally divorced from nature" (50). Our built environment is designed as controlled environments separated from the natural world and consequentially relies heavily on energy-intense technology to achieve the desired conditions. To correct this approach, Mazria speaks of the need for a 'revolution' in design theory and education that would furnish architects with an understanding of natural processes allowing "an architecture intimately linked to the natural world in which we live" (50). With this conceptual change to the kind of building society demands, the trend towards increasing use of energy and resources would begin to reverse, with a significant positive effect on the climate change problem.

Mazria's position establishes the importance of the sustainable design effort and demonstrates the possibilities for positive action if architects begin to play a lead role in the

---

[152]Mazria, Edward. "It's the Architecture, Stupid!" *Solar Today* May/June 2003. Pages 48-51

[153]Not mentioned explicitly but rather obvious from Mazria's tone is the fact that if architects do indeed have such a potentially significant role in solving the environmental crisis by nature of their existing social position, then they can be equally well charged with failing to prevent the current environmental crisis. I would be comfortable with the idea that the strength of our economic mindset not be allowed as a defence on the grounds that no particular pressure can absolve the professional from the contract that she has made to safeguard society health and welfare. In short, if we had the ability to see the problem and to fix it, then the environmental crisis must be seen as a general failure of the profession. We must face this fact.

solving our environmental crisis. The fact that the potential exists, however, does not by itself provide clear direction for architects. Specifically how the climate change problem might be affected by better architecture is only hinted at in a vague way – from a conceptual point of view this is significant because Mazria begins his argument by complaining about the lack of certainty in common technological solutions. What is missing, then, is the kind of clarity that we have required of environmentalist solutions when they come to the point of demonstrating their ability to make effective changes to the fundamental conditions that have created the environmental crisis. The requirements of this criticism perhaps exceed Mazria's intent. His most significant point – that architects are linked to the solution to climate change issues through the widespread and long-lasting impact of their work in designing the built environment – is well made and gives an adequate starting point for our discussion of the role of the architect.[154] But architects still need to decide how to act.

Conceptual Frameworks

Sociologist Simon Guy and architect Graham Farmer attempt to address the question of what sustainable architecture should be. They point out that most of the discussion of green buildings stems from an understanding of the impact of buildings and the wide range of environmental issues that directly relate to the built environment. This impact has been described above. Guy and Farmer notice that discussions about what to do often involve technical comparisons: "The dominant approaches are characterised by performance threshold models, which assess the impact of a building against a range of criteria, which can be directly measured and weighed."[155] These comparisons, they note, "presuppose a degree of agreement on what defines sustainable building" – agreement that, as we have pointed out, may only run deep enough to allow for discussion. Green buildings, they say, can be viewed as social constructions, each representing "differing ecological and ethical values," each contributing to an ongoing discussion of the role of architecture (74).

Guy and Farmer have sketched out what they call the 'competing logics' of this discussion. Taken together, the logics represent the full range of viewpoints: presented and compared on a variety of criteria. Each has an ideological image that functions as a representative emblem. The six logics of green building are discussed briefly below in groupings used by the authors.

The first logic is called *ecological* and given 'sustainability' as the emblematic issue. Second is *smart* which is linked with 'efficiency' as an emblem. Both ecological and smart logics share a technical outlook. In the former, however, the idea that we share a tenuous connection with the natural world entails a moral preference for action that does minimal harm to the environment and if possible seeks ways to recover damage that we have already done. The smart logic corresponds to the ecological modernization paradigm discussed above. Both use a "functional approach" and are "founded on environmental science" (78).

---

[154]Balance on one hand, the idea what Mazria is saying, against the impact that architects may have through culture alone. The final view will be a synthesis of both ideas of how the architect may be of service that mirrors, strangely enough, the common understanding of the architect ministering to both technical and cultural aspects of buildings.

[155] Guy, Simon and Graham Farmer. "Contested Constructions" in Fox, Warwick. (ed.) *Ethics and the Built Environment* New York: Routledge, 2000. Page 74.

Listed third is *aesthetic* which is given the 'new millennium' as an emblem. The fourth is called *symbolic* with the emblematic issue of 'authenticity.' Both of these logics deal with the way that architecture expresses itself outwards. Fifth is given the name *comfort* and the emblem of 'sick buildings.' And finally, the sixth competing logic is *community*, with 'democracy' as the emblematic image. The *comfort* and *community* logics deal with architecture as a social entity. The comfort discourse responds to concerns about the quality of the built environment. The community discourse considers community involvement in environmental action to be of primary importance. Architecture that seeks to establish a sense of community, either through the built form or through the construction process, would fall into this category.

Guy and Farmer do not make a judgment about the value of each logic they present. The suggestion instead is that we pursue a 'pluralistic' view of these threads of discourse. They claim that this position will best recognize the "contingency and value richness" of these threads without becoming a "fragmented relativism" (84). Given the history that we have outlined above, the suggestion that architects treat these logics as equal is highly problematic. We know from our review of the history of the modern environmental discourse, for example that the ecological modernization discourse (which here would be roughly equivalent to the *smart* logic) is the dominate discourse underlying the decision-making processes in most of the world's most developed countries. For architects to act as if all six logics were effectively equal would be to deny the point of view of the global majority. This is not to say, however, that the real and conceptual flaws of the common discourse that were identified in this thesis must be accepted. Although it may serve as a prudent point of departure, architects have the capability, and perhaps responsibility, to approach the building of a sustainable society that goes beyond the limitations of the common sustainable development approach. For this task then, there is further value in examining the full range of logics that Guy and Farmer have identified.

Taking the *symbolic* logic proposed by Guy and Farmer, we can have a second look at the components of the discussion. A key concept of this way of thinking that is directly translated into architectural practice is the tendency to "draw inspiration for indigenous and vernacular building strategies which are seen as indicative of ways in which culture adapts to the limitations of a particular environment" (81). Architecture here is a direct expression of the chosen environmental action. The action not only is corrective in the relationship with the environment but literally builds a cultural artifact to accompany the change and to reinforce it in the future.

The *aesthetic* logic too, has something different to offer. The 'new millennium' emblem represents for this view a strong image of the future. Guy and Farmer speak of a "new architectural iconography" that has the power to transform our "consciousness of Nature" (79) The aesthetic that will do this is supposed to be radically different than the highly 'rational' buildings that are constructed today. What is most intriguing about this discourse is its confidence in the ability of architecture to effect change through the appearance of the building, through the artistic expression of the architecture. In this mode architecture is thought of as being able to not only represent a new culture but also to have a hand in its conception. Beyond the impact on the mainstream of environmental discourse, as characterized by the ecological modernization paradigm, architecture has several other modes of operation that connect in a direct way to the very culture that has to be changed. So here we find an important confirmation that the larger role for architecture that we have been developing is recognised, at least in part, in current discussion. But the equal weighting that Guy and Farmer's green building theory matrix gives to all of the completing

logics does not do enough to demonstrate the unique contribution that architecture can make. Guy and Farmer seem content with the work that they have done in clarifying the discussion. They point out that "the situational diversity and apparent complexity of the green design problem may demand that 'we entertain a pluralistic accounting of our moral positions' (Minteer 1998:334),"[156] and claim that such openness is needed during this time of transformation to a sustainable society. Understanding of the six competing logics allows us to see "that the wide variety of design approaches can bring potential environmental benefits at a variety of scales."[157]

Knowing what we do about the cultural basis for change that is required for an effective solution to the environmental crisis, we know that this position is not sufficient. While we can agree with Guy and Farmer that new 'design innovations' are still waiting to be found, we must argue that from the range of current solutions to the 'problem of green building,' we know already that some will make a fundamental difference and that some will not. When faced with the array of conceptual possibilities that Guy and Farmer present, what is needed on the part of the architect, is the ability to make clear distinctions between the competing value-systems at work and connect the project of architecture to the larger task of creating the physical form for a sustainable society.

The Concrete Image of a Sustainable Society

Architect Christian Norberg-Schulz, a student of early modernist Siegfried Giedion, presents a coherent and concise view of the purpose of architecture in concluding his book *Meaning in Western Architecture*. Architects, Norberg-Schulz says, join other artists in the task of forming physical symbols that reinforce our existential foothold in the environment:

> The purpose of art is to conserve and communicate experienced existential meanings. In perceiving an articulate symbol, a man experiences an act of identification which gives his individual existence meaning by relating it to a complex of natural and human dimensions. Identification presupposes a choice, or, we might say, an act of orientation and orientation implies that any meaning is experienced as forming part of a comprehensive spatio-temporal order.[158]

This 'complex' of meaning contributes to what Norberg-Schulz calls our existential space. Existential space is a perceptual overlay on the familiar geographic space. It involves more than what we see in front of us, it also automatically includes the interpretation of what we see. Our worldview then is linked to our environment in the concept of existential space. Together, they form the meaningful framework for our lives.

Architecture concretizes existential space into places that have the function of allowing us to orient ourselves relative to our physical and cultural surroundings. "Places,

---

[156]Guy and Farmer, op. cit., page 84. Authors quoted reference Minteer, B. A., "No Experience Necessary? Foundationalism and the Retreat from Culture in Environmental Ethics", *Environmental Values* 7:333-348, 1998.

[157]Ibid., page 84.

[158] Norberg-Schulz, Christian. *Meaning in Western Architecture*. New York: Praeger Publishers, 1975. Page 429.

paths and domains are the constituent elements of existential space. Like other symbolic forms they are determined by an interaction between man and his environment."[159] The physical cultural artifacts – the architecture – that identify these places also convey their natural, human or spiritual character. As an example, consider this existential analysis of a jug by Martin Heidegger presented by Norberg-Schulz:

> In the poured water dwells the source. In the source dwells the rock, and the dark slumber of the earth, which receives the rain and the dew of the sky. In the water of the source dwells the wedding of sky and earth. The gift of pouring is the jugness of the jug. In the character of the jug sky and earth are present.[160]

The human action of pouring and the human artifact, the jug, are tied metaphorically to the natural relationship between the sky and the earth. This connection, made by virtue of the understood character of sky and earth in the jug, serves to confirm human activity as meaningfully and appropriately linked to the surrounding environment. It is also able to capture some sense of truth about the functioning of the world that is neither 'seen' in nature nor derived from human society. The maintenance of this meaning is required to ensure continued understanding, i.e. to ensure communication through culture.

The role of the architect has not fundamentally changed with the modernist separation of meaning from its traditional structures.[161] Modern architecture is, however, able to draw on a greater range of cultural characters, to create places that draw cultural references beyond traditional geographic bounds. For this great freedom to translate into a useful advantage, we must recognise both the strength that is available in the available cultural diversity and the importance that the existential space has for our lives. Norberg-Schulz concludes with advice full of warning:

> A meaningful environment forms a necessary and essential part of a meaningful existence. As meaning is a psychological problem, which cannot be solved through control of production and economy alone, architecture, in the true sense of the word, ought to be a primary concern for modern man. . . . Architectural history describes how man found "spatial footholds" under different conditions, and may therefore help us to reeducate our sensibility to environmental characters, and to improve our understanding of the relationship between man and his environment.[162]

In the work of early modernist architects we can see a synthesis of traditional culture and of modern living. Study of these historical conditions and the architecture that was produced suggests the capability of architecture to express a synthetic view of changing and sometimes contradictory cultural values—a characteristic that might be applied to our current struggle with the environmental crisis. We can now say more precisely what the role of the architect (and architecture) in the solution to the environmental crisis may be – or at least clearly identify the potential role. If a sustainable society may only be realistically

---

[159]Ibid., page 431.

[160]Norberg-Schulz (Page 432) quotes M. Heidegger, "Das Ding," Vorträge und Aufsätze II.

[161]Architecture might be seen, through its continued ability to access these traditional sources of meaning, to be resistive of the modern movement.

[162]Ibid., page 434.

achieved through widespread acceptance of the values and ethics that reflect our interdependent relationship with the natural world, then architects have the ability to concretize this change in physical symbols. These symbols, as architecture, both speak of this relationship and actually engage the natural world the way that it should be. The vital importance of this capability addresses both the practical impact desired by Mazria and the cultural impact required by this thesis and outlined by Norberg-Schulz.

The Ethical Implications for Professional Architects

There is here an opportunity for architects to recover their position as well as gain a new level of responsibility as leaders in the move towards a sustainable society. Architects do not suffer from the same constraints of specialisation that scientists do. They are generalists by training and are suited to embrace a wider picture and a concerted group solution. Only professional arrogance and general confusion about the right path to a sustainable society stand in the way of architects applying their skills in this way. Focus should be split between technological competence and developing an understanding of how built projects contribute to a durable and sustainable society.

Ecologists have already taken the lead in understanding the real position of our human culture relative to the environments that we live in. They are the class of professionals that will ultimately have the most to say about both how wrong our worldview is and which factors must be included in the adjusted outlook. Their task does not allow them to translate this learning into the physical realm of culture. Stewardship of our built environment and, by extension, the interface of our culture with the world around us, has been and must be again the domain of architects. 'Has been' because the situation of human culture within the environment through both physical constructions and the accompanying cultural metaphors was the role of architects in traditional societies. 'Must be again' because we are not currently prepared to shoulder this load. Through leadership in environmental issues, architects can work to increase the relevance of their profession.

If the role of architecture (not merely building) is to create an existential foothold for society, as Christian Norberg-Schulz says, then architects may be said to have a responsibility to society to do exactly that. If we break our reluctance to see clearly the situation that we are in, the environmental crisis reveals itself as an existential problem not unlike the basic one that architecture addresses. And as it turns out, the two tasks are closely related in the effective solution that has been proposed by this thesis.

Architecture forms a link between our cultural attitudes towards the world and the physical place in which we build our culture. As such, architects may provide an important and unique insight into the modern environmental discourse. Further, the act of building – seen as a fundamental intervention in the natural world and a fundamental requirement of civilised life – must be considered directly relevant to the ethical dilemma that surrounds the ecological crisis. Architecture, therefore, offers great potential for social change that is both effective and durable – this natural potency for addressing environmental concerns has been overlooked. On these grounds, a wider understanding of the interdependence of life and the impact of our society on the natural world may be achieved.

Professional architect's organisations have recognised the need to promote an ethical responsibility for sustainable design. The most far reaching attempt to do this is a joint declaration made in 1993 by the International Union of Architects and the American Institute of Architects. The declaration recognised three important elements that have been discussed

in this thesis: first, that the current form of our society is not sustainable; second, "that we are ecologically interdependent with the whole natural environment; we are socially, culturally, and economically interdependent with all of humanity;" and third, that the built environment is a major part of our impact on the environment.[163]

In response, the UIA and the AIA promised to change current methods of practice within the profession to fall into alignment with sustainable principles. This includes both the education of students and professionals as well as a concerted effort to address the same issues in the construction industry and in other areas of society. Finally, the declaration proposed a firm direction for architects in the immediate future: to "bring all existing and future elements of the built environment - in their design, production, use, and eventual reuse - up to sustainable design standards."[164] And to provide specific support for this change a comprehensive list of principles and practices was attached to the declaration.[165]

The tone of the declaration indicates that the contributing architects felt not only a need to reform their practice but also the responsibility to do so. Tone, however, does not translate into a formal ethic but there have been some attempts to accomplish this as well. The AIA executive has issued a policy statement on the environment that borrows from the joint declaration with the UIA. The support for the policy favouring environmental concern specifically refers to the professional responsibility of architects:

> All who design or manage the process of change that affects our environment--natural as well as constructed--bear responsibility for their actions. Architects both propose and direct such changes through their practice and influence them indirectly by advising in the formulation of public policy and law and by undertaking corporate action. In carrying out these activities, architects must consider the environmental impact.[166]

Much more support from the profession is needed before such statements will actually enter the AIA's official code of ethical conduct for the architect but the process has been started - in this respect other architect's associations lag behind the UIA and AIA initiative.[167]

The epilogue to this thesis has endeavoured to demonstrate that there is a parallel between the social function of architecture and the cultural change that is required to effectively address the environmental crisis. Further, the intimate connection between our living environment and ourselves - the one that is expressed through architecture - supports the argument that a sustainable society will not be possible without the support of architects' special skills and concerns. The fundamental task for architects then is to recognise the full potential of the contribution that their profession can make, to understand the problem that

---

[163]*Declaration of Interdependence for a Sustainable Future*. UIA/AIA World Congress of Architects Chicago, 18-21 June 1993.

[164]Ibid.

[165]The principles and practices are included in appendix A of this thesis. The suggestions for practice cover four areas including: design outcomes within the ecological context, specific comments about buildings, professional practices, and the development of new innovations.

[166]AIA Policy Statement, "Environment and Architecture" The American Institute of Architects, 1988.

[167]The RIBA, the RAIC and the OAA have all gone as far as to introduce programs promoting the education of architects and of the public.

we are faced with clearly, and to overcome the conceptual and structural limitations of our society. These accomplished, architects will find themselves in a leadership position in the global struggle to establish a sustainable relationship with the world that we live in.

Appendix A: UIA/AIA Principles and Practices

Guidelines For further development of The Declaration of Interdependence for a Sustainable Future

The success of human development now threatens the health of the environment on which we depend. The structures and performance patterns that have developed in our buildings, our built environment equipment, our urban systems and the landscape are the major causes of our present predicament and inevitably the principal arena of opportunity for its resolution. Accordingly, the Architects have developed the following statement of intent.

1. Meeting in Chicago from 18-21 June 1993 to consider the Theme "Architecture at the Crossroads: Designing a Sustainable Future", and conscious of the outcomes of the Earth Summit, the United Nations Conference on Environment and Development held in Rio de Janeiro from 3 to 14 June 1992, Architects from all continents recognized the emergence of global environmental problems, and committed themselves to charting a new course for the Design Professions for the 21st Century.

2. They commit themselves to participating with other professionals and with the local and global community in the development of an ecologically sustainable future.

3. Recognizing the decisive role of local communities in shaping their own futures they commit themselves to engaging in ongoing community education and participatory design and construction processes in the establishment of ecologically sustainable settlements.

4. Also recognizing that the designed and constructed environment is the dominant component of our accumulated capital wealth and shapes our future environmental impact they commit their design and professional skills to the redevelopment and extension of this capital resource in support of sustainable systems of human settlement through design and the use of appropriate technologies.

5. They adopt a world view which embraces individual and collective interdependence with the local and global environment as the basis of a New Design Paradigm of Environmental Interdependence.

6. They accept that the development and utilisation of a new Design Paradigm of Environmental Interdependence must encompass improvement of economic, social, cultural and environmental conditions.

7. They acknowledge that Architects must add to their traditional concerns for

excellence and efficiency a commitment to developing and applying innovative designs, technologies and methods to achieve a sustainable future.

8. They pledge themselves to establishing attitudes and values, and business and professional ethics and practices, to achieve a sustainable future.

9. Aware of the long lead times and great social, economic and technological difficulties associated with the major reorientation of our buildings, urban systems and landscapes that is now seen to be necessary, they undertake to bring the implications of this situation to the attention of the world community and to devise and make widely available appropriate design and development strategies.

10. Recognizing that the imperatives deriving from the evolving environmental crisis are constrained in time, the Architectural Profession undertakes to explore all opportunities for the rapid transformation of the existing built environment stock and the development of new stock to achieve ecological sustainability within the limited time that is likely to be available.

11. Recognizing that motorized movement of people and goods degrades the environment locally and globally they undertake to explore every opportunity, both through the alteration and reconstruction of existing buildings and built environment systems and through new construction, to enhance local self reliance supported by the local complementarity of facilities whilst respecting cultural and environmental requirements.

12. Knowing that urban and near-urban land often has available to it a good supply of water and nutrients they undertake to optimize the biological productivity of urban areas for wood and wood products, fuel, food, fodder, fibres, together with the production of urban landscapes that support the comfort, health and cultural life of the community.

Attachment: Proposed Principles and Practices

Architects involved in the design, planning and building of human settlements and their supportive systems and hinterlands fully support the further development of a global culture of interdependence with the environment and individually and collectively through their professional associations they will work to promote its realisation by adopting the following Principles and Practices.

Principles

Principle 1
Individually and collectively the members of the Architecture Profession will advise their clients and assist with the education of the broader community on the environmental implications of development trends, strategies and policies.

Principle 2

The Architecture Profession will engage with local communities in formulating appropriate strategies and design guidelines for sustainable human settlement which are economically and environmentally appropriate to their particular culture and place.

Principle 3
Architects will, through their work seek to give full expression to a culture of interdependence with the environment.

Principle 4
Architects will advance ecologically sustainable development by contributing to and supporting appropriate designs, products, services and technologies.

Principle 5
Architects should promote the development of an ecologically sustainable future for the Planet and ensure that development strategies, design concepts and innovations which are consistent with, or improve the prospect of, ecological sustainability are made available globally, including to disadvantaged groups and nations, with appropriate mechanism to protect intellectual property.

Principle 6
In developing ecologically sustainable building and settlement practices all sources of relevant knowledge and methods, including those of indigenous people, should be considered.

Principle 7
Architects should promote healthy and environmentally responsible living and behavioural patterns and develop designs and technologies in support of such lifestyles.

Principle 8
Architects will promote development strategies and projects which anticipate the needs, and recognise the rights of present and future generations.

Principle 9
Architects will, through their practices, implement the International Conventions and Agreements for protection of the rights and well being of the Earth and its peoples, the integrity and diversity of the Cultural Heritage, Monuments and Sites, and the biodiversity, integrity and sustainability of the global ecosystem.

Principle 10
The initial education and Continuing Professional Development of Architects should recognise the need for a wide range of knowledge and insights from the Arts, Culture and Humanities, the Natural and Social Sciences, and the Technologies as a basis for understanding the behaviour and management of ecological systems, and for creating ecologically sustainable forms of production, development and settlement.

Practices: Design, Professional Practice and Work Organisation Guidelines for an

Ecologically Sustainable Future

Practices 1:
Architects should ensure that all Design outcomes and work practices should:

1.1 avoid any significant additional and irreversible damage to the environment on the construction site or elsewhere.
1.2 use caution in decision making; in a context of limited information there should be an avoidance of decisions and actions which may result in irreversible damage to environmental assets of air, water, soil, flora and fauna and the ecosystems of which these form part.
1.3 prevent the transfer of environmental damage or contamination across worksite or other boundaries.
1.4 permit future generations to enjoy an environment with at least the same qualities and quantities of environmental assets as present generations.
1.5 preclude the irreversible reduction of biological or cultural diversity.
1.6 create designs, buildings, structures, products, services and technologies, which operate and function in ways which are environmentally beneficial or neutral in their effects.
1.7 use preventative approaches, using clean and ecologically sustainable materials and processes, in preference to curative, or ameliorative measures.
1.8 rehabilitate and restore degraded environments as part of the Design and Planning process

Practices 2:
The work of the Architecture Profession should be directed to create buildings, structures, products and technologies throughout the built environment and the landscape which:

2.1 use materials which are non-toxic or of very low toxicity, are reusable, which can be eventually recycled through non-hazardous processes, and which do not decrease biodiversity by threatening species of flora and fauna with extinction.
2.2 use materials and combinations of materials that can safely be returned to the biosphere without threat to humans or other life.
2.3 are designed for a long life, are reusable for other purposes, and are not rendered prematurely obsolete through changes in fashion.
2.4 are designed so that they may be assembled and disassembled to permit the replacement of broken, damaged or non functioning components, and be modernised and updated through rehabilitation or retrofitting with improved components and systems.
2.5 enable their use for other purposes when their original use is ended.
2.6 are efficient in their use of energy, are capable of further improvement in their energy efficiency, which operate, where applicable, within the boundaries set by solar income, and which utilise sustainable and renewable energy sources.
2.7 minimise the use of energy and waste in their fabrication and construction.
2.8 include innate "smartness" or "intelligence", where this is applicable, to enable self management and regulation of component systems.
2.9 promote the health and well being of the users and of the biosphere.
2.10 promote, respect and nurture cultural values and cultural heritage.

2.11 exemplify methods of practice that facilitate and encourage user participation in the design, construction and future management processes of buildings, the built environment, built environment systems, and the landscape.
2.12 recycle of provide for the recycling of all material flows, including glass, metals, plastics, paper, organic materials, nutrients, and water.
2.13 form part of, or contribute to the development of, locally self reliant local communities based on local complementarity of life supporting facilities.
2.14 promote pedestrian access to a wide range of life supporting facilities, encourages the non-motorised movement of people and goods and discourages motorised transport.
2.15 encourages the use of very efficient methods of motorised transport of people and goods where such movement is necessary.

Practices 3:
A Planetary culture of Interdependence requires Architects to operate professional practices which ensure:

3.1 that they run their professional practices and their offices in ways that are compatible with global sustainability.
3.2 that they conduct relationships with suppliers, customers, clients, employees and the community with the same professional standards and ethics that they apply to their own practices.
3.3 that Environmental auditing, monitoring and forecasting are utilised to ensure that the well being of both present and future generations, and other species are adequately protected and nurtured.
3.4 that work and decision making are equally informed and guided by an understanding of socio-economic and ecological realities.
3.5 that similar criteria of acceptable environmental impact are applied in all countries and locations, irrespective of their socio-economic status.
3.6 that the ecological integrity of the planetary commons of oceans and atmosphere are respected and protected, and not used for the disposal of wastes which threaten environmental integrity at the local, regional or global level.
3.7 that products, services and technologies which degrade the environment, decrease biodiversity, and threaten the health and lives of present and future generations are not used.

Practices 4:
Architects should promote the development of new designs and innovations, and where appropriate reintroduce old but neglected practices which :

4.1 restore and rehabilitate degraded ecosystems, and their component soil, water, air, flora and fauna.
4.2 protect and maintain the health and well being of people by improving the quality of the environment in which they live.
4.3 protect, maintain and conserve the integrity and diversity of biological systems, and of cultural and heritage structures and artefacts.
4.4 ensure that energy is conserved wherever possible.
4.5 ensure that energy use in buildings, appliances and built environment systems is

efficient.

4.6 base the choice of primary energy wherever possible on sustainable and renewable resources.

4.7 where it is necessary to use non-renewable energy resource, use that resource that is least damaging to the environment.

4.8 aim to design buildings and their support systems that can operate on the solar and solar derived energy that is available.

4.9 minimise the use of energy and waste in the fabrication and construction of products, buildings, structures and technologies.

4.10 enable products, buildings, structures, and technologies to be more easily assembled and disassembled so that damaged, non functioning and broken parts can be easily replaced.

4.11 improve the effective life of buildings, structures, products and technologies, by the use of long lasting non-toxic or very low toxicity materials, and by the development of cost effective regimes for their long term maintenance.

4.12 permit the continuous updating and modernisation of building structures, products and technologies through design which enables their easy rehabilitation, including by the retrofitting with more advanced components and systems.

4.13 provide the equipment and other means to reduce the production of wastes, to reuse wastes for new productive purposes, and to effectively recycle waste materials.

4.14 promote the use of non-toxic or very low toxicity reusable materials and building components in buildings, structures, products and technologies.

4.15 enable buildings, structures, products and technologies to be used for other purposes when their initial usefulness is ended.

4.16 develop and use materials which can be recycled and eventually returned safely to the environment.

4.17 improve the forecasting, monitoring, assessment and auditing of environmental changes, and the efficiency of management of environmental resources.

21st June 1993

Selected Bibliography

Alexander, Christopher. *The Timeless Way of Building*. New York: Oxford University Press, 1979.

Bell, ML and DL Davis. "Reassessment of the lethal London fog of 1952: novel indicators of acute and chronic consequences of acute exposure to air pollution" *Environmental Health Perspectives* Volume 109, Supplement3, June 2001:389-94.

Brinckerhoff Jackson, John. *A Sense of Place, A Sense of Time.* New Haven: Yale University Press, 1994.

Carson, Rachel. *Silent Spring*. Boston: Houghton Mifflin, 1994.

Cole, H. S. D. et al., eds. *Models of Doom: A Critique of the Limits of Growth.* New York: Universe Books, 1973.

Constantine, Eliadis "Deep Lake Water Cooling: A Renewable Technology" *Electrical Line.* May/June 2003. Pages 26-28.

Crosby, Alfred W. *Ecological Imperialism: The Biological Expansion of Europe, 900 – 1900.* New York: Cambridge University Press, 1986

Devall, Bill. "The Deep, Long-Range Ecology Movement: 1960-2000–A Review" *Ethics and the Environment,* 6 (1) 2001, pages 18-41.

Dewey, John. *Reconstruction in Philosophy.* New York: Henry Holt and Company, 1920.

Fernández-Galiano, Luis. *Fire and Memory: On Architecture and Energy.* Translated by Gina Cariño. Cambridge, MA: MIT Press, 2000.

Fischer, Frank and Maarten A. Hajer, eds. *Living with Nature: Environmental Politics as Cultural Discourse.* Oxford: Oxford University Press, 1999.

Fox, Warwick. *Towards a Transpersonal Ecology: Developing New Foundations for Environmentalism.* Boston: Shambhala Publications, Inc., 1990.

——, ed. *Ethics and the Built Environment.* New York: Routledge, 2000.

Giedion, Siegfried. *Mechanization Takes Command: A Contribution to Anonymous History.* New York: W.W. Norton and Company, 1969.

Glass, D.V., ed., *Introduction to Malthus.* New York: John Wiley & Sons Inc., 1953.

Grossman, Mark. *The ABC-CLIO Companion to the Environmental Movement.* Santa Barbara: ABC-CLIO Inc., 1994.

Guha, Ramachandra and Juan Martinez-Alier. *Varieties of Environmentalism: Essays North and South.* London: Earthscan Publications Ltd., 1997.

Hajer, Maarten A. *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process.* New York: Oxford University Press, 1995

Hawken, Paul. *The Ecology of Commerce: A Declaration of Sustainability.* New York: Harper Business, 1993.

——, Amory Lovins and L. Hunter Lovins. *Natural Capitalism: Creating the Next Industrial Revolution.* New York: Little, Brown and Company, 1999.

Jackson, John Brinckerhoff. *A Sense of Place, A Sense of Time.* New Haven: Yale University Press, 1994.

Jansson, AnnMari, et al., eds. *Investing in Natural Capital: The Ecological Economics Approach to Sustainability.* Washington: Island Press, 1994.

Jones, W.T., et al. ed. *Approaches to Ethics: Representative Selections from Classical Times to the Present.* Toronto: McGraw-Hill Book Company, 1985.

Kay, James J. "Ecosystems, Science and Sustainability," in Ulgiati, S., Brown, M.T., Giampietro, M., Herendeen, R., Mayumi, K., (eds) Proceedings of the international workshop *Advances in Energy Studies: Exploring supplies, Constraints and Strategies*, Porto Venere, Italy, 23-27 May, 2000. Pages 319-328.

——, Regier, H., "Uncertainty, Complexity, And Ecological Integrity: Insights from an Ecosystem Approach" in P. Crabbe, A. Holland, L. Ryszkowski and L. Westra., eds. *Implementing Ecological Integrity: Restoring Regional and Global Environmental and Human Health.* Kluwer, NATO Science Series, Environmental Security, pages 121-156.

Kibert, Charles J., Jan Sendzimir and G. Bradley Guy, eds. *Construction Ecology: Nature as the Basis for Green Buildings.* New York: Spon Press, 2002.

King, Bruce H. "Narrative, Imagination and Environmental Ethics" in *Ethics and the Environment* 4(1): 23-38.

Kuhn, Thomas S. *The Structure of Scientific Revolutions*, 3rd Ed. Chicago: The University of Chicago Press, 1996.

Lakoff, George and Mark Johnson. *Metaphors We Live By.* Chicago: The University of Chicago Press, 1980.

Lamb, Kara L. "The Problem of Defining Nature First: A Philosophical Critique of Environmental Ethics" *The Social Science Journal*, v. 33, no. 4, pages 475-486.

Langer, Susanne K. *Feeling and Form: A Theory of Art Developed From Philosophy in a New Key*. London: Routledge and Kegan Paul Limited, 1953.

Leach, Neil, ed. *Rethinking Architecture: A Reader in Cultural Theory.* New York: Routledge, 1997.

Leopold, Aldo. *A Sand County Almanac: With Essays on Conservation From Round River.* New York: Ballantine Books, 1966.

Lévi-Strauss, Claude. *Myth and Meaning.* Toronto: University of Toronto Press, 1978.

Lomborg, Bjørn. *The Skeptical Environmentalist: Measuring the Real State of the World.* New York: Cambridge University Press, 2001.

MacDonald, Mary. *Agendas for Sustainability: Environment and Development into the Twenty-First Century.* New York: Routledge, 1998.

Malthus, Thomas Robert. *An Essay on the Principle of Population.* New York: Augustus M. Kelly Publishers, 1971.

Mazria, Edward. "It's the Architecture, Stupid!" *Solar Today* May/June 2003. Pages 48-51

McDonough, William and Michael Braungart. *Cradle to Cradle: Remaking the Way We Make Things.* New York: Northpoint Press, 2002.

Meadows, Donella H. et al. *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind.* New York: Universe Books, 1972.

Miller, Char and Hal Rothman, eds. *Out of the Woods: Essays in Environmental History*. Pittsburgh: University of Pittsburgh Press, 1997

Miller, G. Tyler. *Living in the Environment: Principles, Connections, and Solutions*, 10th ed. Toronto: Wadsworth Publishing Company, 1998.

Nesbitt, Kate, ed. *Theorizing A New Agenda For Architecture: An Anthology of Architectural Theory 1965-1995*. New York: Princeton University Press, 1996.

Norberg-Schulz, Christian. *Intentions in Architecture.* Cambridge, MA: The M.I.T. Press, 1965.

——. *Meaning in Western Architecture.* New York: Praeger Publishers, 1975.

Norton, Brian G. "Biodiversity and Environmental Values: In Search of a Universal Earth Ethic" *Biodiversity and Conservation* 9: 1029 - 1044, 2000.

O'Riordan, Timothy. "The Politics of Sustainability," in Turner, R.K., ed., *Sustainable Environmental Management: Principles and Practice.* London: Belhaven Press, 1988.

Palmer, Joy A. ed. *Fifty Key Thinkers on the Environment.* New York: Routledge, 2001. [There are two advisory editors: David E. Cooper and Peter Blaze Corcoran]

Pestel, Eduard. *Beyond the Limits to Growth: A Report to the Club of Rome.* New York: Universe Books, 1989.

Pezzey, John C.V. *Definitions of Sustainability*: *UK CEED Discussion Paper No. 9.* London: UK Centre for Economic and Environmental Development, 1989.

Pianin, Eric. "Danish Professor Denounced for 'Scientific Dishonesty' Panel of Scientists Assails Scholarship of Book Praised in Press -- 'The Skeptical Environmentalist'" Washington Post. Wednesday, January 8, 2003; Page A20.

Rapoport, Amos. *House Form and Culture.* New Jersey: Prentice-Hall, Inc., 1969.

Rees, William. "Ecological footprints and appropriated carrying capacity: What urban economics leaves out" *Environment and Urbanization*, 1992, Vol. 4, Issue 2.

Rogers, Adam. *The Earth Summit: A Planetary Reckoning.* Los Angeles: Global View Press, 1993.

Runyan, C. and Norderhaug, M. "The Path to the Johannesburg Summit," *World Watch*, May/June 2002, Vol.15, Issue 3.

Sachs, Wolfgang. *Planet Dialectics: Explorations in Environment and Development.* Fernwood Publishing, Halifax: 1999.

Saul, John Ralston. *Voltaire's Bastards: The Dictatorship of Reason in the West.* Toronto: Penguin Books, 1993.

Schmidheiny, Stephan with the Business Council for Sustainable Development. *Changing Course: A Global Business Perspective on Development and the Environment.* Cambridge MA: The MIT Press, 1992.

Suzuki, David with Amanda McConnell. *The Sacred Balance: Rediscovering Our Place in Nature*. Vancouver: Greystone Books, 1997.

——. "Episode 1: Journey into New Worlds" *The Sacred Balance.* Toronto: Canadian Broadcasting Corporation, 2003. Video.

Von Weizsäcker, Ernst, Amory B Lovins and L Hunter Lovins. *Factor Four: Doubling Wealth – Halving Resource Use.* London: Earthscan Publications Ltd., 1997.

Waddell, Craig, ed. *And No Birds Sing: Rhetorical Analyses of Rachel Carson's Silent Spring.* Carbondale: Southern Illinois University Press, 2000.

World Commission on Environment and Development. *Our Common Future*. New York: Oxford University Press, 1987.

Wright, Robert. *Nonzero: The Logic of Human Destiny.* New York: Pantheon Books, 2000.

Zimmerman, Michael E., et al., ed. *Environmental Philosophy: From Animal Rights to Radical Ecology.* 2nd Ed. New Jersey: Prentice-Hall Inc., 1998.