
Inverting sustainable development? Rethinking ecology, innovation and spatial limits

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Abstract: Over the years, two strands of thought on Sustainable Development (SD) have emerged, often identified as ecologism and environmentalism, respectively. This paper suggests that there exists a third rhetorically excluded option, namely large-scale industrial expansion into space. Access to raw materials found on the Moon as well as unfiltered solar energy would dramatically increase the stock of resources and energy while providing unlimited sinks for pollutants; thus satisfying two of the determining factors of sustainability. Traditionally, the dilemma of resource scarcity has been a concern for environmentalists calling for a reduction of energy and material flows. Correspondingly, the promise of space exploration has been limited to technological optimists whose economic framework rarely acknowledges any such scarcity. By reconciling the politics of scarcity with technological optimism, this paper proposes a unifying political vision for the 21st century.

Keywords: sustainable development; SD; space policy; future studies; the precautionary principle.

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Biographical notes: Rasmus Karlsson is pursuing a PhD at the University of Lund, Sweden. His upcoming dissertation surveys images of the future found in political parties. In his research he also holds a wider interest for the relationship between time and policy making, intergenerational justice and sustainable development.

1 Introduction

The last hundred years has brought about unprecedented changes in human living conditions around the planet. Being a century of ideology, it proved exactly how capable humanity has become of reshaping its social and physical environment through political action. Considering this, it is paradoxical that the future to such a high extent seems to be cloned – a mere continuation of the present with increased attention to economic values, outbreaks of military confrontation and mounting environmental problems. Recovering from the impossibilities of utopia, the early 21st century has become an era characterised by pragmatism, short political time-horizons and the lack of compelling visions of the far-future. In the words of James Graham Ballard:

“Sadly, at some point in the 1960’s our sense of the future seemed to atrophy and die. Over-population and the threat of nuclear war, environmentalists concern for our ravaged planet and unease at an increasingly wayward science together made everyone fearful of the future. Like passengers on a ship blown towards a rocky coast, we retreated to our cabins and drew the curtains over the portholes.” (Ballard, 1999, p.3)

Though the world miraculously survived the nuclear psychosis, managed to stop the destruction of the ozone layer and saw billions lifted out of absolute poverty since the 1960s, new threatening images of international terrorism, runaway technological development (as in the popular Matrix-saga) and precarious changes in the global climate have now once again darkened our outlook on the future.¹

Working as a cognitive antipode, this paper will sketch an alternative global future emerging from the field of environmental sustainability. Often identified as the key question for the next century, the logic of unchecked growth on a finite planet calls for radical solutions as world population approaches 6.5 billion and is estimated to peak at around 10 billion by 2070.² Sharing this alarmist approach, the foremost ambition of this paper is however not to preach ‘doom and gloom’ but to scan the established discourse for what I regard as a rhetorically excluded alternative future. To be feasible, such a scan must take place within a specified normative context. Considering how vast the discourse on environmental sustainability has become, it would in fact be rather precipitate to believe that any account of alternative futures could be exhaustive. The manifold of alternative futures is a problem which futurists often try to overcome by analytically discriminating between

- 1 possible
- 2 probable
- 3 preferable futures (Marien, 2002, p.270).

Employing that distinction, it is clear that this paper constitutes a search for a *preferable future*.

Constituting a normative effort, something has to be said about the underlying values. Contemporary social science is often thought of as being in transition towards a greater acceptance of normative reasoning, leaving untenable dreams of achieving the ‘value-neutral’ stance of the natural sciences behind. Still, as transcendent absolute values are deconstructed, norms can no longer be justified with simple reference to any divinity or to ‘the scientific nature’ of humanity. Several authors, including Brian Barry, have tried to avoid the relativity of individual opinion by grounding their calls for environmental sustainability and intergenerational distributive justice within contractual conceptions of justice (Tremmel, 2006). However, such attempts have encountered serious intellectual challenges, including but not limited to the so called *non-identity problem* (Page, 2006). Luckily, in a paper of this kind, the ultimate source of moral obligations is not of primary concern as even “the lack of a meta-ethical theory does not preclude the possibility of ethical practice” (Ogilvy, 1996, p.68). If that philosophical shortcut really works, a plausible normative yardstick for preferable futures could be their capability of facilitating *quality survival for present and future generations of humans* based on the belief that all human beings require equal moral respect and concern.³ It is a norm which I think can be widely agreed upon even if it remains both simplified and anthropocentric. Regarding the temporal dimension of this normative attempt, I want to connect to David Brier’s review of time horizons among futurists

(Brier, 2005). When evaluating whether an alternative future is in accordance with a particular norm it is always tempting to ask how distant that future is thought to be. At the same time, as the intellectual operation of this paper remains normative and not predicative, any attempt to give an exact time span would be misplaced as the focus then would be shifted from the ideas as such to the feasibility of achieving them before the coming of a specific year. This said it is none the less clear that the kind of broad social futures I will try to analyse in this paper all are 'long-range futures' (Brier, 2005, p.835), placing them 20–50 years into the future. By applying such an extended time span, this paper also tries to shed new light on how the sustainability of our current trajectory should be assessed.

However, before articulating this alternative future, a typological framework covering existing conceptions of environmental sustainability must first be created.

2 The sustainability spectrum

With more than 300 possible definitions, environmental sustainability and its cousin, Sustainable Development (SD), have become the basic building blocks of any social understanding of the relationship between humanity and its physical environment (Dobson, 1998, p.33). Yet, the sheer multitude of definitions also makes it a contested concept which can be used in often contradictory ways (McManus, 1996). With such a rich discourse, it is only natural that numerous attempts to give a more systematic shape to the debate have been made. Already in 1991, Lélé Sharachchandra published a critical review of how the concept of SD had developed since it first came into prominence in the early 1980s (Sharachchandra, 1991). He argued that attempts to define SD as merely sustained growth in material consumption should be rejected in favour of interpretations which emphasised the fundamental ecological constraints that nature presents to all human activities. However, when analysing the discourse on SD it becomes clear that even when opting for this second interpretation, its meaning remains ambiguous at best.

Many authors, including Andrew Dobson, have argued that there are in fact two strands of environmental thought. Dobson identifies these as

- 1 environmentalism
- 2 ecologism respectively

employing the following definitions:

“environmentalism argues for a managerial approach to environmental problems, secure in the belief that they can be solved without fundamental changes in present values or patterns of production and consumption,

and

ecologism holds that a sustainable and fulfilling existence presupposes radical changes in our relationship with the non-human natural world, and in our mode of social and political life.” (Dobson, 2000, p.2)

Between these two strands, a whole spectrum of different ontological assumptions, risk assessments and preferred remedial strategies spans. An influential attempt to provide a typology for this spectrum of environmental ideologies was made by Pearce (1993). Pearce enumerated four different political positions, divided into two broad categories depending on whether they are essentially technocentric or ecocentric. In *Justice and the*

Environment, Dobson provided a 'discursive' résumé of SD by studying the evolution of the term through an extensive literature survey. Finally, Michael Jacobs has given an analysis of SD through four 'faultlines': environmental protection, equity, participation and scope of subject area (Dobson, 1999, pp.21–45). By drawing on the work of these three authors, I will now try to construct two ideal types of environmental sustainability. These two ideal types are thought to represent 'extreme' positions, marking the outer bounds of the concept. To simplify, and to avoid neologisms, I will call the two *alternative futures*

- 1 ecologism
- 2 environmentalism respectively

well aware that both concepts are often used to describe environmental ideologies situated somewhere between the two ideal types. It is reasonable to ask why I have chosen not to include neo-classical cornucopian conceptions, of the kind expressed by for instance Robert Solow or Julian Simon, as an ideal type in the spectrum.⁴ My main reason for not doing this is that I find it logically contradictory to include theories of perfect substitutability in any typology of environmental sustainability, since, if these theories are correct, the whole problem of intergenerational justice would be illusory. Throughout, my ambition has been to closely study and follow the typologies presented by Pearce, Dobson and Jacobs with the hope of benefitting from their authoritative surveys of the literature. Having presented the two ideal types through this typological framework I will then, over the next chapters, elaborate their content according to the categories provided along the y-axis.

Table 1

	<i>Ecologism</i>	<i>Environmentalism</i>
Green labels	Preservationist position	Managerial position
Type of economy	Deep green economy-based on steady state and self-sufficiency; heavily regulated to minimise resource-take	Global growth oriented but increasingly green economy
International political structure	Bioregionalism	States with some intergovernmental cooperation
Equity	Global redistribution of wealth	Not emphasised
Perceived gravity of environmental problems	Alarming, on the verge of a global ecological collapse	No immediate urgency
Strategies for sustainability	Radically reduced scale of economy and population	Ecological modernisation through piecemeal adjustments
Substitutability between different types of capital	Low	High
Attitude towards technological development	Extremely sceptical – exception for 'soft technology'	Moderately optimistic
Application of the precautionary principle	Strong – applied in all sectors of society and integrated in its constitutional framework	Weak – only applied in specific policy areas after public debate

2.1 *Ecologism*

The first of the two alternative futures which this paper will examine is the classical programme of 'deep ecology' which, to a varying degree, can be associated with such authors as Arne Næss, Edward Goldsmith and Robert Heilbroner. Its fundamental rationale is the perceived incompatibility between the industrial life form and the natural environment. It holds that the flourishing of human life requires a radically different society living in an enduring, dynamic equilibrium with other forms of life.

Perhaps the most important key for understanding ecologism is its politics of place. While rejecting the global growth oriented market economy, ecologism seeks decentralisation of production and consumption but also of political authority. For ecologism, "the local community is the best body to keep development within the guidelines of human-nature reciprocity" (Merchant, 1992, p.220). The environmental activist Peter Berg coined the term 'bioregions' in the early 1970s and it has since been an integrated part of the deep ecological discourse. The guiding principle of bioregionalism is that the natural world should determine the political, economic and social life of communities (Dobson, 2000, p.100). It is an immediate observation that few people living in urbanised environments know where their water flows from, what kind of soil their home is built on or are able to name even a few native plants or birds. By redrawing our political and economic maps, bioregionalists seek to reconnect people with their natural environment and thus foster responsibility and long-term commitment for sustainability. Yet, the deep ecological programme goes further and considers knowledge of the local land as only the first step in a process of dissolving the entire modern industrial civilisation.

Though inherently sceptical to the possibilities of environmental sustainability through 'big science' (Cohen, 2006), it would nevertheless be wrong to simply label the deep ecological movement as neo-luddite and hostile against all technology. Authors, such as Arne Næss, envision 'soft technology', based on local resources with diminishing standardisation, as an alternative to the current scientific and technological paradigm (Næss, 1989, p.98). This kind of self-reliance would be one important component in a drastic reduction of trade and global economic interdependence, carried out with the purpose of minimising overall flows of energy and material. The same goes for personal mobility

"greens argue for reduced mobility as a part of their hopes for generating supportive, satisfying relationships in their decentralized, self-reliant communities. From this point of view travel involves dislocation of the ties that hold such communities together." (Dobson, 2000, p.91)

Unfashionable as this view may be it is a most natural reaction to increasingly global travel patterns – given the premise which informs much of the deep ecological movement, namely that, without radical changes in lifestyle and production, we will be faced with an ecological catastrophe within the near-future (Dobson, 2000, p.20). Similar apocalyptic tones can be found in almost all writings of political ecologism and it is reasonable to view 'sacrifices' of material living standard in that perspective (O'Leary, 1994, p.216). 'Sacrifices' should be written within quotation marks here as many activists of the deep ecological movement see a reduced material consumption as

- 1 merely an adjustment closer to the global average
- 2 as a liberation of sorts, away from a culture that values 'a distorted attitude to life' (Næss, 1989, p. 25).

Global redistribution of wealth should consequently not be understood as raising the rest of the world to the economic standard of the West, but that, to quote Rudolf Bahro, "the path of reconciliation with the Third World might consist in our becoming Third World ourselves" (Bahro, 1996, p.88). Of course, such statements beg the question of compatibility between the political programme of ecologism and liberal democracy as we know it. Turning to Marcel Wissenburg:

"liberal democracy is totally incompatible with attempts to dictate peoples' tastes and preferences, yet we may reasonably assume that preferences are one of the determining factors of sustainability." (Wissenburg, 1998, p.7)

The perceived incompatibility between liberalism and sustainability have led some authors, like William Ophuls but also neo-Malthusians as Paul Ehrlich, to argue that an ecological sustainable society of dramatically reduced population and material welfare can only be realised through authoritarian means. When describing the basic characteristic of a future ecological society of steady state, Ophuls also clearly envisions communalism based on authority

"as the community and its rights are given increasing social priority, we shall necessarily move from liberty toward authority, for the community will have to be able to enforce its demands on individuals." (Ophuls, 1992, p.285)

The decentralisation of the political sphere is here thought to constitute a safe-guard against the kind of remote, arbitrary and capricious authority we normally associate with 20th century totalitarian states.

2.2 *Environmentalism*

While ecologism has become an ideology in its own right, providing an analytical description of society as well as a far-reaching political programme, environmentalism is mainly the product of the established political and economic institutions (Dobson, 2000, p. 3). Its sources are not the works of philosophers but practical policy-documents produced by governments and various think-tanks. Perhaps the most striking feature of environmentalism, when regarded as an alternative long-range future, is how much it resembles the present state of affairs in the advanced industrial democracies. Over the last few decades, numerous reforms including pollution charges and other Economic Incentive (EI) instruments have been introduced in these countries. Continuing on this course, environmentalism embraces economic growth as a means of achieving environmental sustainability according to what is suggested by the Environmental Kuznets Curve (EKC). The EKC is based on the assumption that indicators of environmental degradation first rise and then fall with increasing income per capita. It is also thought that, as "incomes rise, the demand for improvements in environmental quality will increase, as will the resources available for investment" (IBRD, 1992, p.39). Consequently, environmentalism believes that a decoupling of economic activity and environmental impact will take place as the economy is directed more and more to services and lighter manufacturing (Pearce, 1993, p.20). It argues that different kinds of resources are highly substitutable through technological development and that

innovations eventually will make humanity overall less dependent on basic raw materials. Finally, it holds that most losses “of natural capital can be functionally compensated for by increases in capital of human origin” (Dobson, 1998, p.41).

Thus, sustainability is not defined as sustaining a certain amount of natural capital indefinitely into the future, but rather as securing that coming generations will have the possibility of achieving a living standard at least as high as the present. Though generally optimistic about technology, environmentalism is more pragmatic about the long-term possibilities of innovation. Instead of grand research projects in the pure sciences, it favours applied research capable of producing immediate economic benefits for industry and society.

Underpinning all these statements and their managerial approach to environmental problems is the conviction that the biosphere generally exhibits a linear behaviour, allowing sufficient time for adjustments if new ecological difficulties would emerge. In areas such as global warming, only minor mitigating policies are recommended as costs imposed on future generations are discounted (Nordhaus, 1994). In conclusion, environmentalism values present welfare and sees no reasons to drastically reform neither the political nor the economic system, unless any ecological crisis would make it absolutely necessary to do so.

3 Critically evaluating the two ideal types

By the early 21st century, warnings of a looming ecological crisis are nearly as numerous as they were thirty years ago.⁵ Some, like Bjørn Lomborg, take this as proof that these warnings are ‘simply not in keeping with reality’ (Lomborg, 2001, p.4). Others, perhaps surprised by the resilience shown by the ecosystems thus far, are none the less convinced that an ecocatastrophe is nearly inevitable as the patterns of mass consumption take on global proportions. Siding with either position seems to be just as much an expression of faith as of empirical evidence, at least while the environmental problems remain at their current manageable levels.

This chapter aims to critically read the discourse on environmental sustainability as expressed in the two ideal types and their corresponding alternative futures.

3.1 Ecologism

In one reading, ecologism is a mere continuation of 19th century fear of technology and degeneracy, brought together under the idea of decline and its end-of-civilisation rhetoric (Herman, 1997, p.400). With its apocalyptic undercurrent, ecologism is in fact ‘unique in the context of modern political ideologies’ (Dobson, 2000, p.20). Still, even the most optimistic observer of world affairs must admit an important difference; while philosopher like Oswald Spengler saw the crisis of Western civilisation as part of a predetermined metaphysical sequence which all cultures share by necessity, contemporary ecologism is informed by empirical evidence of such trends as biodiversity loss, deterioration of marine environments, deforestation, water shortages and climate change (Stevens, 1996).

It is not an exaggeration to say that the democratic legitimacy of ecologism hinges on the balance of this difference. Despite its glossy images of a restored equilibrium between humanity and its natural environment, it is reasonably clear that an alternative

future of ecologism can only be brought about through immense human suffering. Any attempt to disentangle the thick global web of economic transactions would have numerous unintended and possibly disastrous consequences. Even at its end-state, a future of ecologism would imply a dramatic reduction of human freedom and quality of life, at least when measured in traditional terms like average life expectancy, physical mobility and individual opportunities. Its radical reforms and the coercive means their implementation are likely to require, can probably only find wider public support first if and when a global ecological crisis is upon us and at that stage, there may not be so much natural environment left to preserve. This catch-22 also has another dimension which many authors within the discourse have observed. Næss for instance writes “the extreme seriousness of our current situation must first be widely recognized. But the longer we wait the more drastic will be the measures needed” (Næss, 1989, p.31).

Not only does the distance between our current society and a future of ecologism seem to be considerable, but, “for many the direction of envisaged change appears to constitute a *retreat* from modernity rather than a development upon it” (Pepper, 2005, p.9). Having tasted the fruits of modernity in terms of material welfare, sanitation and the freedom of travelling the continents, there might also be a rather substantial psychological barrier on the way to a deep ecological society.

Turning to the international scene, that psychological barrier raises serious questions about the possible transition to a future of ecologism. Following the long tradition of the tragedy of the commons, the logic of collective action is likely to turn such a transition into a classic game of prisoners’ dilemma. Only if globally orchestrated does ecologism become a feasible political strategy. Otherwise, without a global span, the question “why should our country lower our welfare in favour of environmental sustainability if others don’t?” would immediately arise. Even with such a global covenant, the temptation for any state or group to cheat would be tremendous. Naturally, the most obvious possible gains from cheating are military and strategic. Any geographic territory which would reject the antimodernistic creed of ecologism would pose a severe threat to all of its neighbours. The problem would be further emphasised by the fact that the countries which today contribute the most to environmental degradation, and whose participation is thus most needed, are also those which would see the largest relative reduction in their military capacity. Considering similar dilemmas of collective action also in other areas such as resource economics, it is not surprising that the political potential of ecologism is often thought to be limited by its idealism and unrealistic assessments of existing socio-economic dynamics.

Part of the problem is of course that for the time being, the details of any deep ecological sustainable society remain vague. As Timothy O’Riordan writes:

“The sustainability transition is an illusion. No one knows what a sustainable society would actually look like – not its economy, its political structures, its social ethos or its capacity to survive without chaos.” (O’Riordan, 1996, p.140)

Even so, ecologism conveys images of what a *less unsustainable* society would look like. By turning away from alienating Western consumerism and advocating a redistribution of essential liveability requirements to all people, ecologism is, at least partially, compatible with the normative yardstick of quality survival for present and future generations. Still, it is a future in which humanity has proven utterly incapable of wisely wielding the power of modernity. By reversing its fundamental trends – less dependency

on manual labour, increased functional differentiation and growing international interdependence – ecologism is likely to bring humanity back to its past of subjection to nature.

3.2 *Environmentalism*

Clearly unwilling to pay that price, the mainstream political response to environmental sustainability has been one of pragmatism, as outlined in the ideal type of environmentalism. The obvious criticism against such an approach is that it will prove insufficient. More precisely, a future of environmentalism is only possible as far as a number of conditions are satisfied, including

- 1 that vital non-renewable resources are not depleted faster than they can be substituted
- 2 that renewable resources are not exploited to such an extent as to cause permanent and irreversible damages to the resource base
- 3 that the planet sinks are capable of absorbing the massive amounts of pollutants and toxic substances created by a global consumer society.

Even if all these conditions are satisfied at the moment, the current trajectory becomes less sustainable the deeper we look into the future. This is self-evident as long as the system is (kept) closed and the elasticity of substitution declines with time (Reynolds, 1999).

Still, the notion that humanity will run out of essential resources has a long history of inaccurate projections. Recalling Thomas Malthus, William Stanley Jevons and the Club of Rome's original report from 1972, it is tempting to think that we will always find new deposits as prices increase (Lomborg, 2001, pp.147–148). Historical data for reserves of oil, coal and iron ore also support such a conclusion. Yet, together with Donella Meadows and others, I believe that much of the debate on this topic has been confused by an inability to discriminate between resources and known reserves (Meadows, 2004, p.89). While resources denote the total quantity of a material in the crust of the earth, reserves are the amount of the material which has been discovered or inferred to exist. Reserves may go up as prospecting technology improves or prices increase; resources on the other hand only and inexorably, go down. The same logic essentially applies to pollutants and emissions. Though simple dilution may have been sufficient at earlier stages of industrial civilisation, it is becoming increasingly clear that the world sinks are beginning to fill up – causing global warming, diminishing fresh water supplies and a continuous build-up of hazardous wastes. In some cases, as with radioactive wastes, it is not primarily the limited size of the sinks that is problematic but the whole concept of storing such toxic and mutagenic substances within the closed geological, chemical and biological system of the planet.

Environmentalism is based on the hope that environmental degradation will decline with higher levels of economic welfare, a hope theoretically formulated in the EKC. However, there are several reasons to doubt the validity of the EKC:

- 1 that even if the environmental impact caused by each increase of GNP per capita may decline beyond some point, this does not necessarily mean that the *total* impact follows the same pattern

- 2 though countries, as they get richer, may direct more of their *production* towards services they hardly will reduce their aggregated *consumption* of material goods
- 3 that the observed dematerialisation of the economy may in fact be caused by the displacement of 'dirty industries' to developing countries.⁶

These arguments against the EKC are also supported when measuring ecological footprint and total resource throughput which both are higher (and not lower as the EKC would suggest) in the industrial countries (Spangenberg, 2001). Despite mounting evidence that business-as-usual is not a long-term sustainable strategy, it is on the other hand not certain that the current mode of industrial production and consumption cannot continue for many decades into the future.

However, the greatest threat against the sustainability of the current trajectory could be its own success. Currently,

"the privileges are regionally reserved because a similar increase of affluence in Africa, Asia or South America ... would hasten the advent of an environmental Armageddon." (Næss, 1989, p. 25).

If not paired with a dramatic reduction in consumption among the rich countries many authors on environmental thought, like Næss, believe that a global environmental crisis will be close to inevitable when low cost airlines, private cars and the whole range of consumer goods eventually become affordable to, especially, the wider Asian population.

In other words, if economic wealth becomes more equally distributed in the future, the tension between intragenerational and intergenerational justice is likely to increase. Apparently, the ideal type of environmentalism forces us to make a cynical trade-off between welfare for present generations (living in the poor South) and welfare for future generations (living in the rich North). An overall *reduction* to sustainable levels of global consumption is deemed politically impossible while an overall *increase* to Western levels is considered equally unfeasible given the available ecological carrying capacity and our current technological level. Consequently, even if minor tinkering and regulation will prove sufficient to abate some of the environmental problems prevalent in the industrial countries, a future of environmentalism may fail miserably in meeting the normative yardstick of this paper when given a global span.

4 Inverting sustainable development?

It is obvious that the two ideal types and the futures they inspire are informed by different interpretations of available empirical data carried out within conflicting normative contexts. Superficially, we seem to be left with a choice between

- 1 radical and potentially coercive reforms aimed at avoiding a global ecocatastrophe
- 2 a wait-and-see attitude which may be nothing but an expression of bubble-headed optimism.

Neither strategy appears to be truly capable of facilitating long term *quality survival* for present and future generations. Of course it is possible to imagine a manifold of strategies which try to find a middle-road between these two ideal types. In *The Sane Alternative*, James Robertson suggests that instead of either a future of business-as-usual

or a totalitarian conservationist future, we should seek ‘the Sane, Humane, Ecological (SHE) future’ which is characterised by moderate decentralisation and an equilibrium economy-based on increasingly self-sufficient communities (Robertson, 1978). The difference between the ideal type of ecologism, as presented above and SHE is consequently one of the degree and not of kind. Just as it is far beyond the scope of this paper to empirically determine if the piecemeal and pragmatic reforms of environmentalism are likely to succeed, it is not possible to thoroughly evaluate the feasibility of strategies such as SHE. It is clear however, that most strategies, departing from environmentalism with a more radical agenda of decentralisation and demodernisation, are likely to be vulnerable to similar criticism, including

- 1 problems of collective action as some states or groups may cheat
- 2 unintended consequences during the build-down of international trade and commerce
- 3 the psychological resistance associated with reversing a culture-based on infinite expansion of economy, science and technology.

Challenging the belief that any environmentally friendly policy must consist of reduction, conservation and moderation of human activity, I will in this chapter outline a future in which overall human activity is not reduced but increased while environmental sustainability is secured. Before going any further however, it is worth stressing that this alternative future should be interpreted not as a constitutive blueprint but as a tentative regulative idea (Karlsson, 2005). Normative efforts to inspire political change are often oscillating between two unsound extremes, either their scope is so small that they become completely harmless or they take on such a large bite of radical reforms that they become utopian. It goes without saying that the alternative future that will be outlined here is dangerously close to the latter fallacy. To at least somewhat offset that risk, I would like to point out that I fully agree with Leszek Kolakowski in his conclusion that a utopian scheme “is disastrous as a political program but ... indispensable as a guiding sign” (Kolakowski, 1990, p.140). I also find it important that opinions diverging from the established discourse are voiced, if only – in the humble manner of John Stuart Mill – so that a “clearer perception and livelier impression of truth, produced by its collision with error” (Mill, 1974, p.76) can be achieved.

4.1 *Rethinking a fundamental axiom*

Many texts on SD, even by leading scholars, start off by asserting that all human activities take place within absolute limits since the system remains ‘finite, non-growing and materially closed’ (Daly, 1996, p.1). Resource depletion, the exhaustion of available sinks and the scarcity of useable land are all functions of this fundamental axiom.

Surprisingly, this axiom of finitude does not only seem to be a rather new theoretical innovation but also empirically questionable. Applying a historic perspective, the solution to scarcity in closed systems has always been to open those systems through expansion, for instance overseas. Correspondingly, as the optimism of the space programmes peaked about 40 years ago, space colonisation was perceived as the natural way of dealing with any planetary scarcity of sources and sinks. The whole solar system was at that time seen as the land of opportunity on which the future of humanity would be built. Since then manned missions to the Moon, astronomical observations of the

asteroid belt and unmanned probes to our nearby planets have confirmed that the resources available are practically unlimited (Prantzios, 2000). This is especially true for high-grade minerals and rare nuclear isotopes as H_3 . Besides raw materials, space industrialisation holds the promise of providing

- 1 abundant solar energy unaffected by the day/night cycle (Glaser, 1997)
- 2 the option of moving many environmentally harmful industries off the planet's surface which would give substance to the EKC
- 3 access to unlimited sinks for pollutants and toxic substances such as radioactive wastes.

4.2 *Constructing the vision*

Yet, in the search for environmental sustainability, space industrialisation is typical for the kind of solutions that are discursively excluded. Being a radical expression of technological optimism it has fallen completely out of vogue except perhaps among those whose economic framework rejects the problem of resource scarcity anyway (Simon, 1996, pp.137–138).

To invert traditional conceptions of SD means to accept that environmental trends are as alarming as the deep ecologists believe, yet that the remedy should be quite the opposite of what they have suggested hitherto. Instead of trying to constrain the basic forces of modernity, the trick would be to use the current momentum of these forces to free humanity of its spatial limitations. By reconciling the politics of scarcity with technological optimism (Salmon, 1977), it is a vision constructed around three mutually supporting elements:

- 1 space industrialisation
- 2 global federal governance
- 3 massive research projects in both the pure and applied sciences.

I will now in turn address these three components.

As the general political mood has shifted away from the grand projects of high modernity, it has become a common opinion that space settlements and the like are nothing but romantic dreams of the past. The main reason behind this pessimism is the prohibitive costs associated with any larger industrial expansion into space. No nation alone, not even the USA, would be able to muster the resources necessary for such an undertaking. Moreover, diverting money from other civilian programmes such as social welfare, would not only cause substantial hardship but would also most likely prove insufficient.

This is why, when the vision proposed in this paper takes space industrialisation as one of its core strategies for achieving sustainability, it is conditional on the emergence of an entirely new set of global institutions. David Krieger has argued that world peace and SD will rise and fall together since “it is unlikely that sustainable development can take place in a climate dominated by war and the preparations for war” (Krieger, 2002, p.14). By taking that argument one step further, I will now suggest that just as the military industrial complex represents a formidable threat to sustainability it also represents an untapped source for transformative political action.

According to the Stockholm International Peace Research Institute, world military expenditures amounted to a conservatively estimated US\$1035 billion in 2004 (Sköns et al., 2005). This works out to \$2.8 billion each day – more than \$100 million an hour. Of this, the USA alone accounted for 47%. Confronted with such figures, especially in comparison with the estimated \$19 billion required to eliminate starvation and malnutrition worldwide (The Worldwatch Institute, 2003), it is easy to become disillusioned. At the same time, we have to remember that all these resources are used to protect us, not from any external threat, but from ourselves. Thus, within a different global institutional framework, nearly all this money could be directed to other purposes.

Witness how the European Union (EU) has allowed Europe to make the transition from an anarchic system in which conflicts were ultimately resolved by force or threats of force to a ‘political and judicial system’ (Glossop, 1993, p.21). Simultaneously, economic interdependence, especially between the military superpowers (i.e. the USA and China), has turned outright war into a non-viable option (even without invoking notions of Mutual Assured Destruction). In such a global context, the transfer of sovereignty to a supranational body – guaranteeing the territorial integrity of all countries – would be less of a utopian scheme and more of capitalising on what already has become a *fait accompli*. With redefined spatial limits, potential future conflicts over scarce resources would also be possible to avoid, creating a self-reinforcing feedback loop of peace and development.⁷

Inverting traditional conceptions of SD means to acknowledge this interpretation of global responsibility and use the resources currently allocated to the military industrial complex to fund space industrialisation (as outlined above) but also a new and aggressive research agenda for the natural sciences, enabling breakthroughs in fields such as energy production (Hoffert et al., 2002), nano-miniaturisation and spaceflight.

By challenging the paradigmatic viewpoint that only autonomous scientific and technological development guided by the market forces remains possible, this alternative vision of the future takes its point of departure in science decoupled from short-term capitalistic logic. Instead of merely hoping that advancements in for instance electronic consumer goods will somehow lead to ‘far-future technologies’ due to some obscure spill-over logic, the research agenda in this vision is one which is conscious and capable of making democratic priorities (Feenberg, 2002). Unable to ascertain the planet’s ecological carrying capacity as billions of new consumers are integrated into the global market, such a radical agenda, in combination with space industrialisation, can be seen as a novel way of interpreting the precautionary principle.

4.3 Schematic summary

Returning to the typological framework presented earlier, it is time to sum up the basic characteristics of this vision and relate them to the futures of ecologism and environmentalism. From the following systematic comparison it becomes evident just how much closer the proposed vision stands to ecologism than to environmentalism in terms of for instance perceived gravity of the environmental problems, long term perspectives on global equity and the possibilities of substituting different types of capital. But by reconciling itself with the kind of technological optimism normally only found among ‘the enemies’ of the environmental movement, its political programme would be essentially different.

Table 2

	<i>Ecologism</i>	<i>Environmentalism</i>	<i>Inverting SD</i>
Green labels	Preservationist position	Managerial position	Proactive position
Type of economy	Deep green economy-based on steady state and self-sufficiency; heavily regulated to minimise resource-take	Global growth oriented but increasingly green economy	Growth oriented market economy operating within a strong universal legal framework
International political structure	Bioregionalism	States with some intergovernmental cooperation	World federalism with extensive local autonomy
Equity	Global redistribution of wealth	Not emphasised	Global redistribution of wealth
Perceived gravity of environmental problems	Alarming, on the verge of a global ecological collapse	No immediate urgency	Alarming, on the verge of a global ecological collapse
Strategies for sustainability	Radically reduced scale of economy and population	Ecological modernisation through piecemeal adjustments	Space industrialisation, intensive research and international disarmament
Substitutability between different types of capital	Low	High	Low
Attitude towards technological development	Extremely sceptical – exception for ‘soft technology’	Moderately optimistic	Extremely optimistic
Application of the precautionary principle	Strong – applied in all sectors of society and integrated in constitutional framework	Weak – only applied in specific policy areas after public debate	Proactive – inventing technology to solve problems which not yet have become critical

5 Conclusions

The main ambition of this paper has been to challenge the standard image of a singular, myopic or even ‘cloned’ future. By restating the fundamental openness of the future to political change, three alternative futures have been described with the purpose of encouraging a more conscious understanding of our current historical situation. Over the last few decades we have become increasingly used to employ long time horizons when studying many of the problems facing humanity such as climate change, resource depletion and the build-up of toxics like cadmium. Strikingly pathological, the same kind of extended timeframes are lacking when it comes to articulating political responses to those challenges. Thus, the democracies of the world repeatedly have found themselves addressing the problems of the future with today’s primitive and feeble tools. Instead of proactively laying out a course into the deep future, the political system of most consolidated democracies has become reactive and passive, trapped within its own short time horizons.

Undoubtedly maladaptive and therefore destructive to the global environment, humanity in the early 21st century seems to be faced with a choice between dramatic reductions of welfare or a 'wait-and-see'-attitude which can prove dangerously complacent. By rejecting this dichotomy and instead combining ecological concerns with a proactive far-future orientated research agenda, diverse interests and viewpoints may become possible to unify. Building on social and economic mechanisms already in place, it is a vision which does not require the kind of quasi-mystical 'inner change' of humanity which deep-green writings tend to emphasise. Unbearable as such pragmatism may be for many greens, we must keep in mind that the proposed vision is not suggested as a final harmonic end-state but merely as an attempt to find new breathing space in a time of dramatically increasing global demand.

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Notes

¹Admitting that this is notoriously difficult to prove empirically, we can consult the International Social Survey Programme of the year 2000 in which 17,344 respondents in 38 countries were asked 'taking everything into account, the world is getting better'. To this statement only 30% agreed, 43% disagreed and 27% chose to neither agree nor disagree.

²United Nations Population Division (1998) *World Population Projections to 2150*.

³The Australian human ecologist Doug Cocks argues that exactly 'quality survival' is as a reasonable long-term social goal (Cocks, 2003).

⁴Though both authors have published extensively, many core motives of this viewpoint can be found in *The Ultimate Resource* by Simon (1996).

⁵Among recent contributions to this genre I would like to mention James Speth's *Red Sky at Morning* (Speth, 2004).

⁶Though a recurring theme in environmentalist literature, the claim that sustainability in the developed world is achieved through migration of environmental dangerous industries to the developing countries seems to be only partially confirmed by empirical data (Cole, 2004).

⁷As Thomas Homer-Dixon has argued, conflicts over resources are otherwise likely to increase in the future as overall scarcity is increased (Homer-Dixon, 2001).