

Agenda 21:
Arguments for Appending a Population Reduction
Program

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ABSTRACT

This paper argues for revisions to be made to Chapter 5 of Agenda 21 to include specific population reduction goals in order to restore efficacy to the UN's sustainable development initiatives. The paper opens by demonstrating through dialectical analysis why population reduction strategies should be elevated to share top priority with poverty alleviation strategies as the two over-arching pillars of international development strategy. The discourse then turns to a critical review of the scientific data pertaining to the scale and scope of environmental degradation caused by current sustainable development policies to make the case that resource constraints will stymie the poverty alleviation aspirations of the international developmental community. Building from the premise that population reduction is the only viable option for validating Agenda 21 as a sustainable development strategy, the paper then examines some of the key socio-economic obstacles to adopting population control policies with the hope that by understanding the source of resistance, work can commence on initiatives to mitigate such barriers. This paper contends that failure to mitigate these barriers will confound any attempts to introduce population reduction policies into international development initiatives.

KEYWORDS

Agenda 21, sustainable development, overpopulation, poverty alleviation, economic policy.

SECTION 1: INTRODUCTION

The mysterious stone statues that stand watch over the coast of Easter Island have been attributed to a technologically advanced civilization which depended on forests for sustenance. Trees prevented soil erosion and provided wood for heating, building habitats and creating ocean-going canoes that helped the islanders to enhance their diet by fishing. According to a recent interpretation, as the forests on Easter Island contracted, so too did the capacity of the islanders to sustain themselves. In short, the downfall of this civilization, much like the downfall of the technologically advanced Norse and Mayan civilizations, was largely due to avaricious consumption practices which overwhelmed the ecosystems upon which the society depended for subsistence (Diamond 2005). If the hypothesized reasons for demise of these ancient civilizations are accurate, the Easter Island experience may forebodingly symbolize the broader fate of our planet if humanity's current unsustainable consumption practices continue.

In 1992, the international community gathered in Rio de Janeiro at the Rio Earth Summit to agree on a set of principles (Rio Declaration) and an action plan (Agenda 21) intended to shape and guide international action on global sustainable development initiatives. At the time, many were critical of the results. Ileana Porras, an advisor to the Costa Rica government at the Rio Earth Summit summed up the critic's view by referring to the Rio Declaration as an "uneasy compromise (of) delicately balanced interests and dimly discernable contradictions held together by the interpretative vagueness of classic UN-ese" (Porras 1993, 23). Even Maurice Strong, the Secretary-General of the Rio Earth Summit, conceded that although Agenda 21 was the most comprehensive strategy on sustainable development ever sanctioned by the international community, it had been

weakened by compromise and negotiation (Elliott 1998). As this paper will endeavour to impart, data over the past decade which highlights environmental degradation and limited progress in poverty alleviation arguably validates Porras' reservations concerning the efficacy of Agenda 21's sustainable development strategy. Global signs of environmental degradation make it imperative for the international policy community to ask the question: *are we on the brink of a global Easter Island tragedy?*

This paper puts forth an argument for revisions to be made to Chapter 5 of Agenda 21 as a solution to returning global consumption to sustainable levels. Chapter 5 of Agenda 21 is entitled "Demographic Dynamics and Sustainability". It is the section in the document that deals most directly with the impact that population has on achieving sustainable development. Nevertheless, remarkably, population reduction is not mentioned once in the entire chapter. Instead, "interpretatively vague UN-ese" (Porras 1993) prevail. The following passages that introduce the programme areas exemplify the level of ambiguity found throughout the chapter:

This chapter contains the following programme areas:

- (a) Developing and disseminating knowledge concerning the links between demographic trends and factors and sustainable development;*
- (b) Formulating integrated national policies for environment and development, taking into account demographic trends and factors;*
- (c) Implementing integrated, environment and development programmes at the local level, taking into account demographic trends and factors. (UN 1992, Paragraph 5-1)*

The premise of the paper is that fundamentally, the principles put forth by the architects of Agenda 21 have considerable merit. However, the absence of a definitive program to facilitate contraction of the global population has rendered Agenda 21 ineffective because globally we are nearing the boundaries of our planet's ecological carrying capacity. *"Taking into account demographic trends"* (UN 1992, Paragraph 5-1) is not enough to facilitate sustainable development, long-term plans to facilitate global population contraction are necessary to avert more serious economic and environmental consequences associated with current unsustainable consumption trends. The compromises that took the teeth out of Chapter 5 initiatives must be nullified in order to enable Agenda 21 initiatives to achieve the bifurcate goals of environmental sustainability and poverty alleviation.

There are four main contributions that this paper seeks to make to the ongoing discourse on sustainable development strategy reform. The first contribution is to demonstrate through dialectical analysis why population reduction should be elevated to share top priority with poverty alleviation as the two over-arching goals of an environmentally sustainable international development strategy. The second contribution is to encourage further critical examination of the scientific data pertaining to the scale and scope of environmental degradation caused by current development practices and re-evaluate the likelihood of there being enough resources to enable attainment of the degree of affluence in developing countries that will allow demographic transition to naturally facilitate population contraction (Lee 2003). This paper contends that the majority of data indicates that there are insufficient resources to support such growth. The third contribution is to highlight some of the key socio-economic obstacles to adopting population control

policies with the hope that by understanding the source of resistance, work can commence on strategies and initiatives to mitigate such barriers. This paper contends that failure to mitigate these barriers will thwart attempts to introduce population reduction policies into international development initiatives. The final but penultimate contribution that this paper hopes to make is to encourage further dialogue to consider the feasibility of amending Chapter 5 of Agenda 21 to adopt a decisive, quantifiable plan to reduce global population.

It should be noted that, in drafting this paper, a conscious decision was made to avoid speculating on what the ideal global population level should be. Moreover, a decision was made not to present prescriptive solutions to the hurdles which impede the adoption of population control strategies. Such issues have broad socio-economic implications that need to be considered by a broad spectrum of constituents to a level of detail that extends well beyond the scope of one journal article. The scope of this paper is limited to the presentation of an argument in support of population reduction and to a subsequent discussion of the hurdles which serve as barriers to achieving such a goal.

1.1 Layout of Paper

Four ensuing sections frame the progression of this paper. Section 2 critically evaluates policy options along a Sustainable Development Policy spectrum. The section concludes with a decidedly Neo-Malthusian postulation that any truly sustainable economic development strategy must incorporate proactive population control strategies in order to achieve ecological sustainability while simultaneously alleviating global poverty.

Section 3 of the paper moves the discourse from theory to practice with an examination of the efficacy of the UN's current sustainable development strategy as prescribed by Agenda 21 and associated documents. In conducting this analysis, it will hopefully be made clear that achieving sustainable development through the strategies outlined in Agenda 21 is untenable given current population levels. Accordingly the third section concludes with a question regarding the efficacy of the existing sustainable development paradigm: *if the United Nations acknowledges that humanity is consuming beyond sustainable levels, why are the countries which adhere to this position, continuing to neglect the adoption of initiatives to reverse population growth trends?*

Section 4 of the paper attempts to address this question by examining four interrelated factors which perpetuate this unsustainable international approach to sustainable development. The central premise of Section 4 is that the international community's well-intended yet misguided approach to sustainable development is caused by "empty world" economic growth theory applied to a "full world", which is: 1) supported and driven by socio-economic pressures that deter population reduction, 2) indecisively contested due to limitations of scientific knowledge and 3) perpetuated by herd behaviour.

Finally, as intimated earlier, Section 5 of the paper concludes by inviting broader discussion on the feasibility of revising Chapter 5 of Agenda 21 to incorporate specific initiatives to facilitate a reduction of global population. In this final section, some key issues in relation to this challenge are raised for consideration as future research directions.

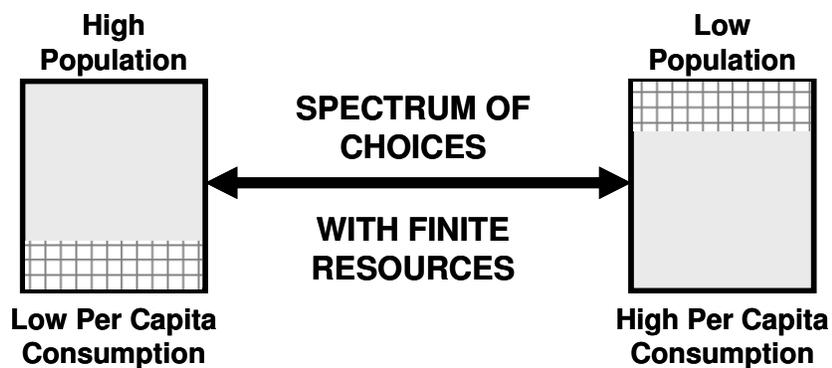
Pessimistically, the constitutive assumption of this paper is that history has shown that dominant social paradigms change very slowly because they are often founded upon consensus opinion dominated by influential thinkers who will resist challenges to the dominant paradigm (Pirages 1982). As Kuhn (1996, 74-75) observed, paradigm change occurs only “after a pronounced failure in the (sic) normal problem solving activity.” This paper reluctantly endorses a perspective that existing scientific evidence of ecological overshoot is compelling but not incontrovertible. Therefore, there will likely be further environmental degradation and more environmental crises on a global scale before true solutions to abating over-consumption emerge. However, the epistemological stance that this paper takes is that prior to paradigm shifts, challenges to the dominant paradigm come from various intellectual communities which introduce new data and perspectives that proponents of the dominant paradigm are increasingly hard pressed to invalidate (Couvalis 1997). This paper semiotically represents one such challenge; however, rather than suggesting that a solution lies in a Kuhnian-style revolution, it embraces a reformist position that Agenda 21’s sustainable development strategy is founded upon sound principles that can be effective in a world with fewer people. Therefore, a conceptual shared understanding of what constitutes sustainable development is needed to frame the discussion in latter stages of this paper.

2. SUSTAINABLE DEVELOPMENT THEORY

The central premise of sustainable development is that the total amount produced and consumed by a population must be supportable by the ecosystem upon which the population depends for sustenance (Paehlke 1995). Emergent technology can and does play a role in enhancing ecological carrying capacity and resource utilization rates (Postel

1994); however, fundamentally, achieving consumptive sustainability necessitates that a balance be established between the planet's ecological carrying capacity (the breadth and depth of resources that the ecosystem provides) and two ineluctably entwined variables- the population size and the per capita rate of consumption rate of available resources. Figure 1 presents a Sustainable Development Policy Spectrum (SDP Spectrum) which outlines an array of ideological options that can facilitate sustainable consumption. The basic premise of the SDP Spectrum is that as resources become scarce, trade-offs have to be made regarding desirable levels of consumption and population. In a world of finite resources, humanity's menu of sustainable development options include: 1) high population levels coupled with low per capita consumption, 2) low population levels coupled with high per capita consumption or 3) a compromise between the two variables made somewhere along the SDP Spectrum.

Figure 1: The Sustainable Development Policy Spectrum



2.1 Share the Wealth Advocates

Three integrated strands of logic describe the ideological premise which supports policy positions from the left hand side of the SDP Spectrum (Figure 1). The first strand of logic is characterized by the tenet that determining the size of one's family is part of the fundamental right of self-determination guaranteed under the UN Convention on Human Rights (UN 1948). Accordingly attempts to influence family size through public policy decisions should be avoided. The second strand of logic is characterized by endorsement of demographic transition theory which postulates that at higher levels of affluence, an inverse relationship exists between affluence and family size (Lee, 2003). Accordingly, advocates of policies from the left side of the SDP Spectrum argue that population levels will decrease without coercion as economies become more affluent. Thus the goal should be to encourage economic growth (Todaro and Smith 2003). The third strand of logic is derived from recognition that the vast majority of global resource consumption occurs in affluent industrialized countries. This position is supported by UN data which estimates that 56% of the planet's resources are consumed by 15% of the planet's population (UN 2007^a). Accordingly, advocates of this strand of logic argue that those who are responsible for the environmental degradation caused by over-consumption of resources should carry the burden of rectifying the problem. This contention was infamously endorsed by former Malaysian Prime Minister Mahithir Bin Mohamad who asserted, "poverty is the second greatest adversary of the environment, second only to the over-consumption of the affluent" (Mahathir 1997).

Weaving these three strands of logic together permits an understanding of the main conceptual strategic premise associated with the ideological left-side of the SDP

Spectrum (Figure 1): Abatement of over-consumption in developed countries and a transfer of wealth (and technology) from affluent to impoverished countries would allow the planet's inhabitants to share in the bounty of natural resources on a more equitable basis and allow demographic transition to naturally induce population contraction. Thus, long-term ecological sustainability can be achieved through such a policy platform.

In opposition, this paper endorses the view of Sagoff (1988) who postulates that efforts to significantly reduce per capita consumption of the affluent top quintile of global society will be inevitably ineffective because such an objective conflicts with the materialistic aspirations that humanity exhibits on a global scale. Globally, greater consumption goes hand and hand with greater affluence (Perkins et al. 2006). Notably, over-consumption by the affluent is not just an industrialized country phenomenon. For example, in 2004-05, the top 5% of the population in India spent over 10 times more on daily consumables than did the bottom 5% of the population (GI, 2006).

Furthermore, in an era of global trade, it must be emphasized that consumption in affluent countries fuels economic growth in developing countries. Accordingly, the level of abatement of consumption in industrialized countries that would be necessary to return aggregate global consumption to sustainable levels would merely serve to degrade economic growth prospects in developing countries. Thus, the logic of the "share the wealth" advocates is self-invalidating.

This opposing position should not be misconstrued to infer that this paper endorses excessive consumption practices. More prudent and efficient use of resources would

undisputedly help to lessen environmental impacts. However, it is a temporary solution at best. Even if a comprehensive framework to reduce excessive consumption of the world's most affluent quintile were viable, the challenge of meeting the basic material needs of 3 billion impoverished people in underdeveloped and developing countries would easily engulf any efficiency gains achieved (Cassils 2004).

2.2 Technological Bolstering

For the past 30 years, a number of progressive thinkers have put forth arguments in support of a notion that a solution to natural capital degradation need not come entirely from consumption reduction or population control. Advocates from this camp embrace the perspective advocated by Hawken et al. (1999) that technological solutions can radically transform the efficiency with which resources are consumed. In relation to the SDP Spectrum (Figure 1), the technological solution is akin to enlarging the size of the box from which resources are drawn. Indisputably, a number of practical achievements have been documented that demonstrate the capability of technological innovations to improve the efficiency with which resources are utilized (Simon and Kahn 1984). Unfortunately, technology has proven to be an ineffective stand-alone solution to achieving fully-sustainable consumption (Meadows et al. 2005). Contrary to the forecasts of technocentric optimists (Easterbrook 1995), emergent technology has not been able to mitigate continued environmental degradation and resource depletion. As the UN has conceded in the Johannesburg Declaration, "The global environment continues to suffer. Loss of biodiversity continues, fish stocks continue to be depleted, desertification claims more and more fertile land, the adverse effects of climate change are already evident, natural disasters are more frequent and more devastating, and developing countries more

vulnerable, and air, water and marine pollution continue to rob millions of a decent life. Humanity is already past the point of sustainable development.” (UN 2002^a, Pt. 13). Given expectations of both continued population growth and increasing consumption (UN 2003^a), assertions that technology is capable of resolving the planet’s environmental problems intrudes upon the realm of chimerical whimsy.

2.3 Conceptual Lens of This Paper: Managed Population Reduction

This paper hopes to demonstrate that facilitating outcomes to the right of the SDP Spectrum in Figure 1 should be the predominant goal if humanity seeks to achieve the bifurcate goals of subsisting within the carrying capacity of the planet’s ecosystems (which should include the preservation of wildlife habitats) while simultaneously allowing citizens at the bottom of the global economic pyramid a chance to amass the levels of wealth necessary to avoid the humane tragedies that have become all too frequent around the world. More specifically, the goal should be to attain universal high standards of living for the global populous through the pursuit of long-term, planned reduction in population levels.

To put this discourse into proper perspective it is useful to review where humanity now stands in terms of population. The exponential *rate* of expansion of the human population is *decreasing*; however, the global population is still dramatically *increasing*. In 1650, it is estimated that the world’s population was 500 million. It took nearly a million years of human existence to achieve this level of population. Two hundred years later, the population had doubled, reaching 1 billion people (circa. 1850). It took only 80 years for the next doubling of population (2 billion in 1930); and then only 37 years to double

again (4 billion in 1967) (Ehrlich 1968). The United Nations estimates that the world's population will reach 8 billion by 2025 (UN 2002^b) and then begin to taper-off at around 9.1 billion by 2050 (UN 2004). This means that the *rate* at which the world's population is expected to double again is estimated to slow to 53 years.

A reduction in the population growth rate should not obscure the main issue - the world's population has grown exponentially to a point where the world's nations have agreed human consumption is past the point of sustainability (UN 1992; UN 2002^c). Furthermore, despite a decline in the rate of population increase, population is still increasing. Our strained planet will be required to sustain the consumption needs of population growth equal to two more Chinas by the year 2050. Therefore, in the absence of a technological solution that will allow us to economically identify and mine resources from other planets in our universe, population reduction is a requisite first step to global ecological sustainability.

As Cassils (2004, 171) aptly points out, "If we humans reduce the global population to a fraction of its present level to, for example, two billion or the equivalent of the population of the Earth (sic) about 1930, it would provide extraordinary benefits. The quality of life of all people would soar. We would have all the advantages of modern technology but little, if any, environmental deterioration."

3. SUSTAINABLE DEVELOPMENT STRATEGY IN PRACTICE

International initiatives to encourage sustainable development are predominantly driven through UN programs which spring from the Rio Declaration and Agenda 21. As should

be expected from an organization that must integrate the wishes of 192 member states, the UN approach to “sustainable development” reflects a compromise position. However, it is significant to note that the compromise strategy for achieving sustainable development - as reflected in Agenda 21 and the UN Millennium Development Goals - clearly favours ideology from the left side of the SDP Spectrum.

The top priority of UN initiatives including those put forth in Agenda 21 and the Millennium Development Goals is to encourage economic growth in the expectation that increased aggregate affluence will also raise the standard of living for the 2.7 billion people on the planet who earn less than \$2 per day (World Bank 2004). This strategy implies a high degree of international confidence in the efficacy of demographic transition theory that was described earlier (Lee, 2003).

Success of the current strategic ideology hinges on the validity of two critical assumptions. Firstly, it assumes that aggregate increases in wealth in poor countries will have a significant impact on those living at the bottom of the pyramid in such countries. Secondly, it assumes that there are sufficient resources to support global expansion in aggregate consumption to a level whereby population contraction will occur via demographic transition. As will be seen, a significant body of data exists which casts doubt on the validity of these two assumptions.

Although on the surface it makes intuitive sense that increased wealth in a country will inevitably cascade down to the poorest ranks, actual data indicates that the cascading effect has been a slow, inequitable process. For example, between 1981 and 2001, the UN

(2007^b) reports that world GDP in current US dollars increased 260% from US\$12.08 Trillion to US\$31.46 Trillion. As Table 1 indicates, over the same period, although there has been clear progress in terms of reducing the number of people living in absolute poverty (earning less than \$1 per day), the absolute number of people earning less than \$2 per day actually increased by nearly 300 million people (Chen and Ravallion 2005). Moreover, the UN reports that the gap between the richest and poorest countries is widening, not shrinking (UN 2006^a). Accordingly, the first critical assumption, that people living in poverty at the bottom of the pyramid will expediently and substantively benefit from aggregate economic growth, may be less valid than it intuitively appears to be.

Table 1: Population of Developing Countries Living in Poverty

	1981	2001
Total population earning less than \$1 per day	1.48 Billion	1.09 Billion
% of population earning less than \$1 per day	40.4%	21.0%
Total population earning less than \$2 per day	2.45 Billion	2.74 Billion
% of population earning less than \$2 per day	66.7%	52.9%

Source: Chen and Ravallion (2005)

Given the data presented in Table 1 which implies that progress toward alleviating poverty is excruciatingly slow, the validity of the second assumption that there are sufficient resources on the planet to support the economic growth necessary to significantly impact alleviation of global poverty becomes tenuous. The Global Footprint Network which conducts annual global assessments of how aggregate consumption

compares to availability of resources on earth supports such dubiety. In 1981, it estimated that fulfilling consumption demand utilized 90% of the earth's bio-capacity (the resources that nature can regenerate in the same year). By 2001, consumption demand utilized 121% of bio-capacity which implies that humanity was consuming 21% beyond sustainable levels. As of 2006, consumption demand was estimated to consume 130% of bio-capacity (GFN, 2007). To reiterate an important observation made earlier, even the UN which is one of the world's most conservative bureaucracies has acknowledged that humanity is "beyond the point of sustainable consumption" (UN 2002^a, Pt. 13).

Accordingly, an overarching paradox that this analysis reveals is: *1) if the United Nations acknowledges that humanity is consuming beyond sustainable levels, why are the countries which adhere to this position, continuing to neglect the adoption of initiatives to reverse population growth trends?*

4. EXPLAINING THE PARADOX

The remainder of this paper sets forth a nomothetic argument that this paradox stems from a conflation of four forces:

- i. ***Empty world economic theory applied to a full world:*** An optimistic belief that our global ecosystems can and will support the level of economic growth necessary to facilitate eventual population contraction as prescribed in demographic transition theory.

Supported and driven by....

- ii. **Socio-economic pressures that deter population reduction:** Which provide powerful justification to continue to adhere to growth-based economic theory.

Indecisively contested due to...

- iii. **Limitations to scientific knowledge:** Which prevents an accurate identification and assessment of risks associated with ecological overshoot.

Perpetuated by...

- iv. **Herd behaviour:** Which inhibits changes to the existing neoclassical growth-paradigm despite increasingly compelling evidence that economic growth theory applied in a “full world” may produce net costs due to costly environmental externalities.

4.1 Avoiding the Lances of Detractors

In the late 1960's and early 1970's, a number of prominent authors published works which predicted a number of ecological shocks associated with further population growth and over-consumption. Paul Ehrlich (1968, ii) in the introduction to his seminal work, *The Population Bomb*, dramatically asserted: “The battle to feed humanity is over. In the 1970's the world will undergo famines- hundreds of millions are going to starve to death in spite of any crash programs embarked upon now.” Meadows et al (1972) quantified such concerns by presenting computer simulations which studied the ecological impact of growth in world population and industrial output. They argued that if such growth trends continued, our planet's ecosystems could not sustain the growth and would begin to show signs of collapse.

In academic retribution for brashly attempting to predict response outcomes in an insufficiently understood, complex adaptive system, when predictions failed to materialize as per the anticipated timeline, the works of these authors were broadly and

aggressively criticized (Simon and Kahn 1984; Easterbrook 1995). Unfortunately, such criticism also eclipsed the indisputable truth underlying the assertions of these authors: in a finite system, there are limits to growth.

This paper resurrects the basic postulations of such authors while consciously avoiding predictive conclusions. The paper embraces the axiom of Beck (1992) who argues that when confronted with ecological risks of potentially catastrophic magnitude, the traditional economic basis for risk assessment should be replaced with a strategy of complete risk avoidance. However, this paper pragmatically extends this rationale to recognize that a challenge to expediently mitigate the humane tragedies associated with poverty should be considered of equal importance to the challenge of avoiding ecological disaster.

Accordingly, following a detailed examination of the characteristics of the four groups of forces which influence the international position vis-à-vis the role of population growth in development policy (Empty world economic theory applied to a full world, Socio-economic pressures that deter population reduction, Limitations to scientific knowledge regarding over-consumption in a finite world, and herd behaviour which inhibits change), this paper will conclude by offering some points for consideration when evaluating the feasibility of revising Chapter 5 of Agenda 21 in order to incorporate specific population reduction strategies.

4.2 *Empty World Economic Theory Applied To A Full World*

From an economic development perspective, the earth is a closed system. Humanity has access to a fixed pool of resources which cannot be expeditiously renewed (i.e. oil, minerals) and a variable pool of resources which can be renewed (i.e. fish, trees).

Regarding non-renewable resources, consumption leads to progressive depletion of existing stocks. Thus, over time these resources become less plentiful and in many cases more expensive to procure as readily available stocks diminish. Oil exploration is a case in point. As readily accessible desert wells dry up, more costly off-shore oil extraction becomes a viable source of supply.

Regarding renewable resources, there are limits beyond which global consumption begins to erode the natural capital base that generates this stream of resources. Take for example, the stock of trees which provide lumber and paper products. If the rate of consumption is greater than the rate at which the stock of trees can be grown, the stock of trees will begin to decline. In other words, our renewable resources may be renewable, but they are also prone to exhaustion by over-consumption.

In an “empty world” where people are few and resources are plentiful, the dent that human consumption makes in existing stocks of renewable and non-renewable resources is negligible. Under such conditions, an enlightened society which is interested in preserving intergenerational justice would endeavour to avoid drawing down non-renewable resources and endeavour to subsist only on the annual bounty of renewable resources. Such practices would constitute a sustainable society.

However, from a practical perspective, we cannot expect to achieve pure and complete self-sustainability even at low levels of population. A number of technologies and critically important products are dependent on non-renewable resources (metals, plastics, minerals, fossil fuels etc.) as factor inputs. Accordingly, over time, even the smallest population base will gradually deplete the stock of non-renewable resources. Nevertheless, in an “empty world”, the depletion of non-renewable resources would occur in most cases over many millennia and renewable resources for the most part could be easily managed to ensure that resource scarcity does not occur.

An “empty world” more or less describes the state of the planet in the late 18th century when Adam Smith first published his cornerstone treatise of classical economic theory, *An Inquiry into the Nature and Causes of the Wealth of Nations*. In 1776, the global population was approximately 900 million people (UN 1999) - approximately 85% lower than it is now. In the comparatively “empty world” of the late 18th century, economists such as Smith, David Hume and later, David Ricardo put forth ground-breaking arguments that the economic betterment of society could be advanced through specialization of labour, concentration of factors of production and overall expansion of the economic base. Indisputably, these catalysts for maximising economies of scale are as true today as they were when they were first put forward. In fact, the sustained application of such growth-centred economic theory has vastly raised global standards of living (Perkins et al. 2006).

Problematically, the volume of non-renewable and renewable resources consumed has also risen throughout the 200 years of economic expansion. This poses an obvious threat

regarding non-renewable resource consumption because once non-renewable resources are used up, critical products that are manufactured from such resources cannot be made without inventing a manufacturing alternative. Given the potential disastrous consequences to the global economy if innovation fails to create substitutes to replace exhausted resources, a modicum of prudence in natural resource management would be sensible.

Less obvious until recent times, high consumption can also degrade the supply of renewable resources. As mentioned earlier, even renewable resources are subject to finite limits. In a full-world with unfettered growth, the supply of many renewable resource flows will eventually be exceeded by demand. At such a stage, further withdrawals of renewable resources will draw down the renewable resource asset base and the ability of the renewable resource asset base to produce further renewable resources will be diminished.

Clearly, it is undesirable both from an environmental perspective and an economic perspective to allow economic growth which consumes resources at a level whereby the capacity of the planet to sustain further growth is diminished due to a degraded environmental asset base. Therefore, the salient question is: *Where does humanity now stand in terms of aggregate consumption and the planet's ecological capacity to sustain such levels of consumption?*

There are divergent opinions on this issue but some salient statistics from prominent international sources give rise for concern that we are closer to the full world scenario than desirable:

- Worldwide about 420 million people live in countries that no longer have sufficient cropland to grow enough food to sustain the population. (WI 2003)
- Human activity is very likely the prominent cause of global warming and this may result in a permanent contraction in global GDP of up to 3% (IPCC 2007; Stern 2006).
- Amplified concentrations of nitrogen and phosphorous caused by human activities could potentially alter plant and aquatic ecosystems to an extent similar in amplitude to the threats posed by climate change (WI 2003).
- “More than one billion people presently lack access to clean drinking water, and another billion people lack access to proper sanitation.” (UN 2002^d, 1)
- Nobel laureate Edward O. Wilson estimates that as a consequence of widespread hunting practices and human encroachment on habitats 20% of the world’s current animal and plant species could be gone by 2030 (Miller 2005). In 1992, over 1,600 distinguished scientists including a majority of the Nobel laureates in the sciences concluded that by 2100, the irreversible loss of species may reach one third of all species now living (UCS 1992).
- Primary tropical rainforests are disappearing at a rate that is estimated to be in excess of 140,000 square kilometres per year (WI 2003).
- In the past 50 years, “the world has lost a fourth of its topsoil and a third of its forest cover” (Hawken et al. 1999, 4)

- Wetlands which are vital bird habitats, marine life sanctuaries and oceanic purifiers have been reduced by over 50% over the past century (WI 2003).
- Over 70% of the world's fish species are either fully exploited or stocks are being depleted. (UN 2006^b)

Pragmatists may be tempted to argue that the extinction of a few species and the degradation of environmental resources and sinks is a small price to pay for eventually solving global poverty. However, as the discourse in the previous section asserted and the data from this section support, the assumption is far from verity that the planet can sustain further aggregate increases in consumption of the degree necessary to alleviate global poverty. Uncertainty over the degree of impact that global warming will have on humanity is but one small example of how insufficient our scientific knowledge is. Predictive uncertainty makes running so close to the limits of ecological capacity very temerarious.

The discussion thus cycles back to the initial question posed at the beginning of this section: *if the United Nations acknowledges that humanity is consuming beyond sustainable levels* (and the data introduced in this section support such a position), *why are the countries which adhere to this position, continuing to neglect the adoption of initiatives to reverse population growth trends?* One explanation stems from the observation that there are a host of economic and socio-cultural artifacts that stimulate forces toward population expansion.

4.3 Socio-Economic Deterrents to Population Reduction

As this section will demonstrate, despite the obvious role that overpopulation plays in encroaching upon humanity's capacity for self-sustenance, there are two clusters of highly influential forces that hinder global adoption of population reduction strategies. Firstly, from a macro-economic perspective, population growth is perceived as a stimulus for economic growth. Both industry and government perceive positive economic benefits to be derived from population expansion. Secondly, from a socio-cultural perspective, there are many forces that hinder population reduction. In fact, as will become apparent, many of these forces are more than just barriers, many actually promote population expansion. Accordingly, policy initiatives designed to reduce population will have to battle economic forces and emasculate deeply inset socio-cultural values that hinder population reduction.

4.3.1 Economic-Political Ideology and Overpopulation

Modern economic theory considers economic growth to be a driving force behind increasing affluence (Straubhaar 2003). A number of studies have demonstrated that in an "empty world", a virtuous circle exists between economic growth and improvements in education, health and longevity (Perkins et al. 2006). Arthur Lewis (1955, 420) summarized the benefits of economic growth in this way, "the advantage of economic growth is not that wealth increases happiness, but that it increases the range of human choice."

Generally, neoclassical economic growth models have treated population growth as an economic asset (factors of labour). These neoclassical economic development models are

largely based on two assumptions - growth is facilitated by either 1) accumulating factors of production (simplified as labour, capital and material inputs) or 2) making factors of production more productive (Perkins et al. 2006). Accordingly, population growth has generally been viewed as economically benevolent because population growth expands the labour force (in the long-run) and this expands the productive capacity of a nation. Furthermore, New Trade theory which emerged in the 1970's, postulates that higher population concentrations enables amplified economies of scale in production because it creates a higher level of consumer demand and provides the requisite level of labour in order to catalyze further economies of scale (Hill 2007).

The exception to the generally benevolent view neoclassical economists have of increasing the population base, occurs in countries where there is high unemployment or rapid population growth. In such circumstances, it is recognized that population increase is not advantageous to economic growth. However, the typical solution to such a dilemma is to seek ways to expand other factors of production (capital) so excess labour can be utilized (Todaro and Smith 2003).

This should not be misconstrued to imply that no attention at all is given to problems which emerge as a result of over-population. For example, Todaro and Smith (2003) acknowledge that over-population in some countries limits the amount of arable land to produce food for the populous. Moreover, Miller (2004) points out that a host of negative environmental externalities emerge due to land use pressures caused by over-population. These include deforestation, soil erosion, declining stocks of fish and animals, inadequate or unsafe water supplies and air pollution (Miller 2004). Furthermore, Perkins et al (2006)

point out that large family size makes it difficult for parents to finance the education of their children and increases the incidence of child mortality as closely spaced births increase the health risks of pregnancy. However, in spite of these well documented caveats to extreme over-population, there would likely be little argument from traditional neoclassical economists that balanced growth of factors of production (labour and capital) is desirable.

Over the past two decades, environmental economics has made great strides in areas such as environmental valuation (Turner et al. 1994), policy mechanisms for averting market failure associated with common resources (Costanza et al 1997) and raising the level of awareness that natural capital must be considered as a part of the economic system and valued accordingly (Tietenberg 2003; Thampapillai 2002). However, these insightful contributions to economic theory share the neoclassical premise that economic growth equals prosperity (Mankiw 1998; Mestrum 2003). The key enhancement that environmental economists make to neoclassical economics is to argue that for ecological market failures to be averted under the traditional economic paradigm, natural capital (both as a factor input and as a sink for absorbing pollutants and waste) must be valued and considered part of the economic cycle (Costanza et al. 1997) .

When one considers the possible adverse affects that comprehensively environmental valuation techniques (Moran 1992; Turner et al. 1994) could have on impoverished communities in a resource constrained “full world”, one is tempted to question whether environmental valuation trades off one problem for another. In a “full world”, if environmental valuation is effectively applied to factor inputs and outputs, the price of

natural resources will increase as natural resource scarcity increases. This will cause consumption of the resources to contract; however, the contraction in consumption will not be uniform across all income levels. Impoverished communities will be most adversely affected by increases in resource prices because less affluent people have less of a financial cushion to absorb such price shocks. Accordingly, although environmental valuation is a noble principle that deserves a more prominent place in neoclassical theory, it can only constitute an effective component of sustainable development (facilitating both environmental improvement and poverty alleviation) in a world where scarcity of resources does not cause prices of natural capital to adversely affect the livelihood of the poor. Relating this logic back to the SDP Spectrum, for natural capital to be affordable to all, population levels must be at levels to ensure that resource scarcity does not excessively inflate prices.

In short, environmental economics offers some positive short-term mechanisms to help abate exploitative consumption of natural resources but it does not offer a long-term solution if population growth continues. In both economic and population terms, *sustainable growth* on a planet with fixed resources should be considered to be an oxymoron (Daly 1990). The current foundation of environmental economics – attaching a full market price to natural endowments – will merely serve to delay ecological overshoot.

From an industry perspective, population growth accentuated by trends toward urbanization is also a desirable outcome. First and foremost, population growth increases the consumer base, and this means that prospects for revenue growth are increased.

Secondly, population growth implies that community populations will become more concentrated and; therefore, the labour pool from which industry draws workers will be enhanced (Cassils 2004). Furthermore, opportunities to specialise production will be heightened (Frank and Bernanke 2007).

From a political perspective, growth of any kind – including population growth – is symbolically a sign of progress. Conversely, population contraction is symbolically a sign of economic weakness – an impaired ability to compete. As outlined earlier, population growth (more children) leads to expanded consumption which, *ceteris paribus*, stimulates economic investment and job creation (Johnson 2004). Moreover, population growth portends higher potential tax revenues (or aid allocations). Accordingly, even in underdeveloped and developing economies with high levels of unemployment, politicians are more inclined to prefer population growth to population contraction.

To summarise, in general, under the current neoclassical growth-centred economic paradigm, economic markets, industry and governments are all generally positively predisposed toward population expansion. A notable exception to this generalization involves cases of extreme over-population, such as that experienced by China in the 1980's, where both environmental well-being and productivity were significantly threatened by over-population and the government was forced to implement population control policies to try and restore the balance (Jowett 1992). Unfortunately, such policies are the exception rather than the rule.

4.3.2 Social Artifacts and Overpopulation

Fortunately for politicians, the economic-political forces in support of population growth are reinforced by social artifacts. Social artifacts are defined as “any product of social beings and their behaviour” (Babbie 2004, 96). Aside from the array of social and self-actualizing justifications that individuals may provide for wanting large families, there are equally valid socio-cultural justifications which in all respects hinder population reduction and in some respects encourage population growth. These justifications include cost sharing, old age security issues, inheritance issues, male despotism, and religion.

In rural communities, the more family members there are, the more labour there is for the fields (at some point) and that means that larger families can earn more while spreading the costs of living over a wider base of people (Gan and Vernon 2003). As such, this phenomenon represents a familial application of marginal benefit theory. There is an incentive for families to have more children as long as the revenue streams generated by each additional child exceed the sum of total variable costs for the child (i.e. food and clothing) plus the opportunity costs associated with sharing living space.

In many poorer societies where severe endemic diseases have led to very high mortality rates, raising more children provides improved security for parents that they will be looked after when they are unable to provide for themselves. Increased childbirth provides a natural social security blanket for families in communities where welfare systems do not exist (Jowett 1991).

As societies become more affluent, demographic transition theory postulates that social artifacts of the kind introduced above diminish in terms of their propensity to induce population growth (Coles 2005). However, there are other socio-cultural factors that hinder the effectiveness of demographic transition to expeditiously induce population reduction despite rising affluence.

One such factor relates to family inheritance. Inheritance in a great number of countries focuses on primogeniture- the conveyance of property to the first male child. Given the a priori assumption that approximately 50% of newborns are female, it follows statistically that for each birth, half of the families that are intent on producing a male heir will be motivated to produce another child upon the birth of a female. Furthermore, half of these families will fail to produce a male on their second attempt. In other words, the quest for a male heir acts a catalyst for population growth.

Male despotism, particularly in impoverished countries, also adds to population growth pressures. In the absence of effective laws and adequate education, male dominance of females undermines family planning efforts. In extreme manifestations of this social artifact, high incidents of rape and associated childbirth add to the population control problem (Clayton 2004).

Globally, many religions also encourage population growth. For example, the book of Genesis in the Old Testament, which plays an influential role in Jewish, Christian and Islamic religious ideology, exhorts disciples to “Be fruitful, and multiply” (Genesis 1: 28).

In practice, some religions (i.e. Catholicism, Islam) even go as far as to discourage the use of contraceptives (Cassils 2004).

In summary, there are a great many economic and socio-cultural forces which hinder population reduction and which in many cases support population growth. In spite of the growing list of adverse ecological consequences of too many people consuming at an unsustainable rate, these forces help to perpetuate global population growth.

The issue of unsustainable consumption by the global populous brings us to the third element which hinders effective response to over-population – scientific uncertainty over how close aggregate consumption is to exceeding the planet’s carrying capacity and what will happen when this capacity is exceeded over a sustained period.

4.4 Environmental Degradation and Scientific Uncertainty

Our global ecosystems are highly complex, dynamically integrated, adaptive systems. This means that there are numerous influential variables (highly complex), which are interrelated and evolve in response to changes in other variables (dynamically integrated) and which can generally adapt in response to exogenous forces (adaptive systems) (Beinhocker 1999). Such complexity gives rise to uncertainty – in spite of the adverse environmental indicators presented earlier, no one knows for sure the extent to which current levels of consumption have degrading our natural capital endowments.

A cursory examination of the climate change dilemma serves as a practical example of how the fusion of these three characteristics – complexity, dynamic integration and

adaptability – confound accurate prediction of impacts of many of the planet’s most severe environmental problems. In just over two centuries of industrialized development, human activities have emitted significant amounts of greenhouse gases into the atmosphere. For decades, the earth’s atmosphere was able to absorb and assimilate these exogenously induced pollutants without any significant repercussions. However, increasingly high concentrations of these gases have gradually surpassed assimilative capacity causing an accumulation of greenhouse gases in the atmosphere. Thus, our atmosphere has begun to absorb more heat and atmospheric temperature increase has resulted. Thus one variable has changed, but this change causes a chain reaction of cause and effects. For example, weather patterns have changed, polar ice caps are melting, ocean currents are shifting, and agricultural conditions are changing. Each of these changes will in turn catalyze changes in other environmental variables (i.e. the viability of some fish habitats will be effected by shifting ocean currents, animal migratory patterns will be altered, and some plants will become extinct in some regions as higher temperatures exceed the species’ range of tolerance etc.). Furthermore, changes in these environmental variables will catalyze changes in other environmental variables. All these cascading changes are indicative of the complex interplay that exists amongst the numerous variables in any ecosystem (Miller 2004). Needless to say, predicting the impact of a change in one variable on the other variables in such a complex system is highly speculative given current scientific understanding.

Inadequate scientific understanding is particularly evident in relation to climate change (Stern 2006). Until very recently, there was considerable dissent over the interpretation of scientific climate change data with some parties arguing that the global warming trend

experienced in recent times is attributable to natural climatic temperature fluctuations that have exhibited warming trends and cooling troughs throughout recorded history (Miller 2004). Only recently has international consensus consolidated to the point where there is now general agreement that it is “very likely” the main temperature increases associated with global warming are due to human activity (IPCC 2007). Yet there is still widespread disagreement over the degree of impact that global warming will have on our planet (IPCC 2007; Gilman et al. 2007).

When viewed from a broader global ecological perspective, global warming should be viewed as a symptom of global over-consumption which is stressing the carrying capacity of our planet. It is simply one negative feedback loop of one element of a much larger ecosystem under siege. In fact, relating population growth back to the problem of global warming, Dyson (2003, 138) makes the point that over the next half century “the effect of population growth in the developing regions alone would outweigh a 40% reduction in CO² in the developed regions”. However, as we are seeing with global warming, the absence of irrefutable science promotes the perpetuation of business-as-usual patterns of consumption until symptoms become undeniably obvious. As Kuhn (1996) points out, there appears to be a tipping point where the body of new evidence becomes enough to cause a paradigm change but until that point is reached there will continue to be vested interests which prevent an intellectual exodus from status quo tenets. This collective resistance has been referred to as the herd behaviour (Rook 2006).

4.5 Herd Behaviour & Resistance to Change

Herd behaviour can be conceptualized as a risk aversion strategy. Animals and people herd together because there is safety in numbers. Business strategists have been known to replicate market entry activities of competing firms to defend against disruption to the status quo (Rook 2006; Barlett et al. 2003). Decisions of investment managers have been occasionally linked to the investing behaviour of other investment managers for similar reasons (Harford 2007). For economists and policy makers, there are three forces that stimulate herd behaviour in support of the maintaining economic status quo.

The first force is a track record of success. For the longest time, advocates of neoclassical development economics have been able to convincingly argue that no other approach to development has achieved the level of global developmental success that neoclassical economics has helped catalyze. According to economic historian, Angus Maddison (2003) global economic growth was practically nil between 1 AD and 1000 AD. Moreover, between 1000 AD and 1800 AD, annual growth averaged a miniscule 0.05% which means that it took more than eight centuries for world income to increase by 50%. However, thanks in large part to industrialization guided by classical economic theory, global economic growth took off in the 19th century and has averaged 1.2% since 1820 (Maddison 2003). Accordingly, much of the resistance to change from status quo is based on a belief that despite some systematic inefficiencies and transitional costs, the global approach to development economics has a track record of stimulating successful human progress (Todaro and Smith 2003; Simon 1981).

The second force in support of herd behaviour is that vested interests in the global economic web are broadly interrelated and deeply entrenched. Like an ecosystem, the economic system is a complex, adaptive system unto itself (Beinhocker 1999). Accordingly, there is a pragmatic justification for resistance to any widespread systematic changes to the current neoclassical economic growth paradigm – the outcome of the changes will be hard to predict and; therefore, drastic change would add an unnecessary degree of risk that should be avoided if at all possible.

The third force supporting herd behaviour is scientific uncertainty, elaborated upon earlier. Lack of scientific certainty over just how many people the planet can sustain and a track record of overcoming severe environmental problems in the past through technology has further served to embolden entrenched interests to argue that emergent environmental problems are merely short-term anomalies that are to be expected in dynamically evolving systems (Simon 1981). No reputable economist would deny the existence of environmental problems. However, in defence of the current economic paradigm, many would point out that command and control mechanisms (i.e. prohibitions and regulations), taxation, the assignment of property rights, and the creation of marketable instruments all represent promising economic mechanisms that may one day correct environmental market failings (Tietenberg 2003). Thus, the problem does not arise from flawed theory but rather arises from hurdles to operationalising the theory. Advocates of this line of reasoning point to successes in managing environmental problems such as ozone depletion and acid rain as proof that the system works when it is operationalised effectively. In the absence of irrefutable scientific data to the contrary, arguments based on past successes are hard to abnegate.

4.6 National Population Policy

In aggregate, the confluence of the four forces that were examined in Section 4 has had an expansionary influence on national population policy. As will be demonstrated, the international consensus seems to be that population growth is desirable for supporting economic growth provided that the population grows at a controlled level.

In underdeveloped countries, explosive population growth is widely considered problematic (UN 2003^b). For example, over three quarters of African country policy leaders view their population growth *rate* as too high (UN 2003^b). Explosive population in many of these countries stems from many of the socio-cultural artefacts that were discussed earlier. The end result is population growth which exceeds economic growth in many impoverished countries. For example, the population of Sub-Saharan Africa is expected to increase by 500 million over the next twenty years despite acknowledgement by leaders in that region that population growth is a problem (WRI 2002).

In developing countries where ecological degradation is intensifying as a by-product of economic activity, many policy makers are beginning to recognize the need to *balance* population and economic growth to ensure that the environment and the country's infrastructure can sustain planned levels of growth. For example, according to the UN, policy makers in over half of the less developed countries consider their state's *rate* of population growth to be too high (UN 2003^b). Nevertheless, population growth is anticipated. It is estimated that by 2025, China, India and Indonesia alone will add over 500 million people to the planet (WRI 2002).

In developed countries where population growth rates have generally decreased to replacement levels, policies are beginning to emerge to encourage higher reproduction. Australia, France, Japan, Singapore and Germany are examples of developed countries where the encouragement of population growth is reflected in public policy to try and stave off social system collapse (Ehrlich and Ehrlich 2006; Longman 2004). According to the UN's World Population Policies 2003, "nearly half of developed countries view their population growth rates as too low. Almost 40 per cent of developed countries have adopted policies to raise their population growth" (UN 2003^b, 1).

The net affect of these trends is that a global increase in population of 2 billion people is anticipated over the next 20 years (WRI 2002).

4.6 The Crux of the Problem

As the SDP Spectrum introduced earlier in the paper clearly illustrated, in a finite system humanity's sustainable development options range between high population-low consumption and low population-high consumption. Our ecosystems cannot sustain a high population-high consumption scenario. Unfortunately, the current trend is toward such an outcome. As Jeffery Sachs recently pointed out, we are already "on an unsustainable trajectory and yet China, India, and large parts of Asia are successfully barrelling ahead with rapid economic development at an unprecedented rate. We are asking our planet to somehow absorb a many-fold increase of economic activity on top of an already existing degree of environmental stress that we've never before seen on the planet" (Sachs 2007).

From the discourse presented in this paper, the crux of the argument should be clear. The existing neoclassical economic growth paradigm served humanity well when population levels were low enough to allow unfettered consumption. However, times have changed and humanity is now faced with a choice: find a new economic model or restore the global population to a level that will allow humanity to leverage abundant resources to improve the universal standard of living for all. This is known as Hobbes' Choice – a choice between two alternatives in which one option is the only viable option. Given the alarming rate of environmental degradation conveyed through recent data, and the absence of a fully vetted theoretical option to replace neoclassical economic theory at a global developmental level, the only viable option is to restore the global population to levels at which a universal high standard of living can be supported by our planet's natural endowments.

5. AMENDING CHAPTER 5 OF AGENDA 21

In the introduction, the point was made that the scope of this paper would be limited to presenting a case for revision of Chapter 5 of Agenda 21. Hopefully, the case presented has been persuasive enough to motivate others to take up the challenge of considering how such an endeavour could be facilitated and what issues would need to be addressed in operationalising such a revision.

Accordingly, in the spirit of participatory engagement, this paper will close by presenting a brief overview of some of the issues that researchers may wish to investigate in considering the impact of such a revision. Specifically, seven issues that merit attention are briefly introduced:

1. **Targeted Population Level:** Effective strategic initiatives need to be based on clear, quantifiable outcomes. Accordingly, an initial step in a Chapter 5 revision would be to establish a desired level of population reduction. The revision should include an end-target such the suggestion by Cassil (2004) to reduce global population to 2 billion. Additionally, the question of what type of short-term progress goals should be set also requires consideration. For example, it may be worth investigating if a target of 7 billion (or some other figure) by 2030 is attainable.
2. **Pace of Population Reduction:** Research into the optimal pace with which population reduction can be viably sustained would also provide invaluable direction to population reduction strategic planning efforts. Since population momentum will limit absolute quantitative progress over the next 20 years, it is probable that aiming for the UN's low variant projection of 7.7 billion by 2050 (UN 2005) would present a bold challenge to the international development community. Research could possibly shed further insight into the validity of such speculation.
3. **Equitable Distribution of Reduction Targets:** Once aggregate targets have been set, a process of negotiation will have to take place to portion out quantitative reduction targets to individual states. Research in any or all issues related to distributional equity would be invaluable for informing judgement as to the international viability of a Chapter 5 revision. Another interesting research departure in regard to operationalising the reduction targets could be to consider

the viability of introducing market mechanisms – population reduction credits – to encourage a cooperative approach to population reduction.

4. **Identifying the Most Socially Acceptable Reduction Strategies:** As outlined in the paper, population control is a contentious issue from a socio-cultural perspective. Accordingly the initiatives designed to catalyze a reduction in population size in each country must consider the socio-cultural barriers that exist. This type of research might be best done at the country level by social anthropologists / economist research teams.
5. **Transitional Costs Associated with Reduction:** By establishing a targeted level for population reduction and the pace at which the reduction can be viably facilitated without incurring massive socio-economic costs, economists could then begin to estimate the transitional costs associated with achieving such an initiative. This is a realm which provides rich fodder to researchers. For example, demographic changes brought about through population reduction policies could potentially adversely affect national economic growth, social welfare programs, international financial reserves, national defence, international aid levels, and environmental protection funding. These affects should all be examined. Population reduction programmes would also impact a number of other intricately interconnected social science fields from education to healthcare and from law to sociology. These impacts too need to be researched. Estimating transitional costs will be a daunting challenge because each country will likely be affected in different ways by population reduction programs. Fortunately, experiences in countries like India, China and Singapore, where one child policies have been implemented in the past, provide key insights into the type of

problems to expect. Accordingly, these experiences present rich platforms from which to conduct comparative research.

6. **Cost of Program Support Mechanisms:** Support costs for other program areas outlined in Agenda 21 have all been assiduously estimated. The same would need to be done for a population reduction program. The costs associated with researching transitional costs, disseminating knowledge related to the program and financing specific country-level initiatives would need to be estimated. Furthermore, consideration of which international bodies would be best placed to oversee management of the program presents an intriguing departure point for further research.
7. **Addressing Economic-political Barriers:** In addition to transitional costs and social costs, effective arguments will be required to mitigate the perceived threat that population reduction policies may adversely affect the global economy. In this area, research directions would be varied and abundant.

This list of issues for further research is far from exhaustive but it does introduce some of the main considerations that policy makers will face if they take up a challenge to revise Chapter 5 of Agenda 21 or undertake efforts to adopt a stand-alone population reduction strategy.

Pessimistically, despite the adverse environmental indicators which instil a sense of urgency to begin a dialogue of the issue of population reduction, realising this goal may still be wishful thinking. Entrenched defence of the existing status quo will be intense given the vested interests of industry and government in supporting the paradigm of

economic growth and given the vested interests of economists in defending a paradigm they have invested their finances and careers in supporting. This paradigm is so firmly entrenched that change is unlikely until exogenous crisis such a cataclysmic environmental crisis facilitates action (Pirages 1982).

Perhaps rather than viewing the ruins of the statues that remain on Easter Island as reminders of a past society consumed by avarice, we should instead view these statues as omens of humanity's overall fate should we decide to continue along our path of unsustainable consumption. Optimistically, global warming may be the crisis that is needed to kick-start the level of inward retrospection needed to facilitate an economic paradigm change. The question is, how severe do the effects of global warming have to get before humanity realises that global warming is not an energy problem; but rather, a symptom of a much deeper ideological misconception of what constitutes sustainable development?

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