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Reclaiming the Definition of Sustainability

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Background and Scope. Since its inception two decades ago, the concept of sustainable development has suffered from a proliferation of definitions, such that it has increasingly come to mean many things to many different people. This has limited its credibility, called into question its practical application and the significance of associated achievements and, overall, limited the progress in environmental and social developments which it was designed to underpin.

Goal. This viewpoint article is intended to re-open the concept of sustainable development for discussion 20 years on from the Brundtland Report, in the context of the current state of the world, our growing understanding of ecosystems and their response to stressors and the parallel increase in recognition of inherent limitations to that understanding.

Approach. Following a brief review of the diverse manner in which the concept has developed over time, we present the case for application of a series of simple conditions for sustainability, originally developed by The Natural Step in the early 90s, which nevertheless still provide a sound basis on which progress towards sustainable development could be monitored. The paper also highlights the unavoidable links between sustainability and ethics, including those in the sensitive fields of population and quality of life.

Discussion. Overall we argue the need for the concept of sustainable development to be reclaimed from the plethora of economically-focused or somewhat vague and un-measurable definitions which have found increasing favour in recent years and which all too often accompany relatively minor progress against 'business as usual'.

Recommendations and Perspectives. The vision encapsulated in the Brundtland Report was ground-breaking. If, however, true sustainability in human interactions with the biosphere is to be realised, a far stronger and more empirical interpretation of the original intent is urgently required. To be effective, such an interpretation must encompass and guide developments in political instruments and public policy as well as corporate decision-making, and must focus increasingly on addressing the root causes of major threats to sustainability rather than just their consequences.

Keywords: Ecosystems; ethical standards; over-exploitation; pollution; public policy; resources; sustainability; sustainable development; uncertainty

Introduction

The idea of 'sustainable development' was first widely articulated in 1987's Brundtland Report (World Commission on Environment and Development) from the United Nations. The 'Brundtland definition' of sustainable development was framed as "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs". It posits that the only truly sustainable form of progress is that which simultaneously addresses the interlinked aspects of economy, environment and social well-being.

In the subsequent two years, around 140 alternative and variously-modified definitions of 'sustainable development' emerged. Currently, it has been estimated that some three hundred definitions of 'sustainability' and 'sustainable development' exist broadly within the domain of environmental management and the associated disciplines which link with it, either directly or indirectly.

A framework to guide human development requires the tight integration of several distinct, yet associated elements. The tight linkage of sustainability concepts to ongoing economic and technical activities, as opposed to traditionally defined 'economic growth', is essential in framing the constraints and new opportunities of subsequent social and commercial development. This does imply changes in direction rather than perpetuation of the old economic model with all of its vested interests, though this is as much an opportunity as a threat, as new markets are created for which new technologies and products will be essential. However, the realisation of this ideal is sadly lacking. Unfortunately, the proliferation of alternative definitions of 'sustainability', which flowed throughout the 1990s, has created a situation where a concept which is central to environmental issues, and solutions to them, has come to mean many things to many constituencies.

Simply, 'sustainable development' is now a term which is increasingly regarded either as internally self-contradictory (an oxymoron) or, at best, plagued by ambiguous or distorted definitions. As a result, there are many constituencies which perceive the term 'sustainable development' as a vehicle to perpetuate many and varied corporate and institutional interests whilst giving the impression of adherence to, and observance of, environmentally-sound principles. This

is hugely unfortunate, as the concept as initially defined is an exceptionally powerful one. However, in the intervening years, vested interests have modified its interpretations, apparently to serve a variety of agendas most of which do not necessarily have the well-being of the planet's supportive ecosystems, or that of people in the developing world, or future generations, at their core.

The problems are compounded by the fact that, by loose applications of the terms, the terminology of 'sustainable development' has become seen as synonymous with 'sustainability' itself. Then, by extension, if we weaken the interpretation of the term 'sustainable development', the term 'sustainability' will also be weakened and compromised by association with perpetuation of established habits and world order. Clearly, the paradigm whereby economic growth and exploitation economics act as primary drivers of resource management is highly questionable and manifestly unsustainable. Indeed, that this concept should drive emplacement of the checks and balances required to protect the environment is increasingly, and rightly, being rejected at many societal levels. Whilst the reasons behind this may appear semantic, the reality is that we have seen a systematic misappropriation of the term 'sustainable development' by some influential sectors of society to justify continuation, for as long as possible, of development patterns that are running in the face of a sustainable and equitable future.

In order to make progress and formulate a workable paradigm to guide society towards a truly sustainable future, it is necessary to reclaim the essence of the initial definition, which rightly positions 'development' after the overarching imperative of 'sustainable'. In short, we have to relegate the dominant economic connotation of development to a less influential and more clearly-defined position in the economic, societal and environmental governance framework. The precondition here is that the concept of 'development' can not equate in practice to continued (poorly-constrained) economic growth.

In this context, 'development' must be redefined in an alternative way. It must necessarily relate to the progressive evolution or 'growing up' of human society as a whole, away from the current exploitative economic paradigm and towards a sustainable process of development which demonstrably leads us to compliance with conditions for sustainability, which, in turn, is a prerequisite for a continuation of cultural and biological evolution. 'Sustainable development' as a concept would then have no more (or less) weighting than concepts such as 'sustainable living', 'sustainable society', 'sustainable economy', 'sustainable agriculture', 'sustainable energy', 'sustainable fisheries' or even 'sustainable chemistry'. All of these terms would also need to be adequately reclaimed and repositioned with a clear goal of sustainability underpinning the subsequent 'development' decisions without preconditioning them. In other words, along with 'sustainable development' itself, all these concepts would essentially become descriptive subsets of the same paradigm, governed by a set of universally-applicable sustainability principles or conditions.

Arguably, it would be better still to move away from a position in which these various subsets of sustainable activities are seen as concepts in their own right, speaking instead of 'sustainability in fisheries' or 'sustainability in society' or 'sustainability in agriculture', and defining what sustainability actually means in relation to each sector. Another way forward, though somewhat recondite, might be simply to invert the definition and refer only to 'unsustainable' practice, with the assumed (albeit often remote) norm being sustainability. These are not just pedantic, definitional issues, but potentially central elements in a strategic reclamation of the concept of sustainability. It can then once more serve as a driving, rather than as a justifying, concept in the realm of environmental protection and restoration.

Accordingly, it is argued here that the idea of 'sustainability', suitably defined, adequately captures all aspects of the economic, environmental and societal elements involved in the overall concept. The question then becomes one of how to define sustainability in terms of robust operational principles and then how to translate these principles into a functional framework within the areas relevant to personal and/or organisational activities.

1 Definition of Sustainability

At the level of the dictionary definition, sustainability simply implies that a given activity or action is capable of being sustained (i.e. continued indefinitely). Within the environmental domain, this is not particularly helpful since many highly damaging practices can be sustained within time frames that, relative to the individual human life span, and certainly the cycles of corporate profit-taking, are seemingly indefinite. Many people, indeed, argue that ecosystems will in time adapt to the changes we inflict upon them; a perverse depiction of a sustainable future world but one to which some nonetheless cling tenaciously.

To approach genuine sustainability, however, it is necessary to introduce elements of temporal scale into our thinking. The ecosystems of this planet, which support the totality of our needs with respect to health, wealth-creation and wellbeing, have evolved over billions of years. Against this timeframe, modern civilisation first emerged around 5,000 years ago (i.e. 70 human lifetimes of 70 years, or around 200 generations). The pace of the change we have visited upon the natural world is spectacularly rapid. It may well also be irreversible, given that it exceeds the rate at which ecosystems evolve. Nonetheless, we do not have the luxury of another 'control' planet to test out this assumption to breaking point. Therefore, we have to treat the 'natural' states of the planet's diverse ecosystems as a fixed reference point to frame our development activities, rather than hope that they may somehow mould themselves seamlessly and benignly to us.

It becomes necessary, therefore, to define sustainability to be more relevant to the human environment. Pertinent examples of definitions which have evolved in the environmental domain, and which can now be found in dictionaries, include 1) "of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or

permanently damaged" [sustainable techniques][sustainable agriculture] and 2) "of or relating to a lifestyle involving the use of sustainable methods" [sustainable society].

Such definitions, while helpful, also lead to further ambiguities, and cannot serve per se as working definitions. Even attempts to expand such definitions into a more holistic and inclusive statement also become hostage to ambiguity, and hence to flexible interpretation to suit vested interests and/or pre-existing agendas. For example, the extensive literature on this subject has included, among many others, the following perspectives:

"...sustainability demands ways of living, working and being that enable all people of the world to lead healthy, fulfilling, and economically secure lives without destroying the environment and without endangering the future welfare of people and the planet."

"The discourse of sustainability demands that we re-examine the policies that substituted the historical necessity of food self-sufficiency with the tyranny of free markets and international trade; those being displaced from peasant agriculture are being impoverished and their communities destroyed."

"In a sense, sustainability demands that farmers 'love the land'. And, each farmer can 'love' only so much land."

"Sustainability demands turning and charting a new course that will improve the quality of our lives and the lives of our children while restoring the gift of natural systems upon which our lives depend."

It seems clear that sustainability can mean a number of things to a variety of constituencies and, while there may be no objection to the sentiments expressed in the respective definitions, they are far from holistic. They highlight the need to derive a set of universally-applicable principles which define sustainability at all scales, disciplines and aspects of human endeavour.

2 Principles of Sustainability

Recognition of the inherent problems involved in the extant use of the term 'sustainable development' and the lack of an all-encompassing definition of 'sustainability' prompted the Swedish scientist Karl-Henrik Robèrt to embark upon a systematic consensual and heuristic approach, to arrive at four first-order 'System Conditions' (principles of sustainability) based upon the scientific foundation of the Laws of Thermodynamics and studies of humans as a social species. A number of logical conclusions flow from these foundations concerning societal and ecological interrelationships. The principles were defined and refined through consultation with members of the wider scientific community, reaching an eventual consensus position in 1992. The System Conditions have subsequently been put to use in a framework that includes logical guiding principles. These principles effectively define how the System Conditions can be approached through a process of 'back-casting'. This strategic dimension of envisioned future compliance then allows a response to the rhetorical question of "How do we get there?" This science-based approach to 'sustainability' and 'sustainable develop-

ment' has become known as 'The Natural Step Framework' after the organization promoting it (TNS). The four TNS System Conditions are currently stated as:

"In the sustainable society, nature is not subject to systematically increasing..."

1. ... concentrations of substances extracted from the Earth's crust
2. ... concentrations of substances produced by society
3. ... degradation by physical means and
4. people are not subject to conditions that systematically undermine their capacity to meet their needs"

The System Conditions relate to the whole biosphere with its human societies. How can they be rephrased and made relevant at the level of the individual and the individual organization? A process of ethical reasoning leads to a simple solution. The principle of "eliminating our contribution" can be cast as an addendum to each System Condition to generate a set of personal/ organizational operational principles. Hence, operational sustainability principles would aim to eliminate our contribution to...

1. ... systematic increases in concentrations of substances from the Earth's crust.
2. ... systematic increases in concentrations of substances produced by society.
3. ... systematic physical degradation of nature.
4. ... conditions that systematically undermine people's capacity to meet their needs.

These objectives can be regarded as 'Enlightened Self Interest', a term which recognizes that to be part of the problem will attract increasing financial risks and lost opportunities in present markets which will translate inexorably to the future. These include resource, waste management and insurance costs, as well as overall market credibility. Being part of the problem also implies that investment strategies may well ultimately turn out to be flawed when considered from a systems perspective.

It is important that each investment, in particular if it is large and will tie resources for relatively long time periods, can respond in the affirmative to three questions: (i) Will this investment measure bring us closer to compliance with the System Conditions? (ii) Can it serve as a flexible platform from which we can launch future measures to bring us into complete compliance with the system conditions later on? This will hopefully avoid investment 'blind alleys'. And finally (iii) will it bring a return on investment (in financial, social and political terms) in a timely manner in order to assure an influx of resources to underpin the process overall?

Moving towards sustainability requires that all human actions are governed by a precautionary ethic (discussed in more detail below), and that the goal is rigorous adherence to the scientific principles above, including the equity issues embraced under System Condition 4. Hence, in principle there is a need also to assure that socially effective processes and constituency-building take place under circumstances of political transparency and open dialogue.

Taken together, these four TNS system conditions effectively define what sustainability actually is and what it implies. It

provides an overarching framework through which decisions relating to the intertwined elements of society, economy and environment can be informed. This set of principles can also act as a broad metric against which the changes being promoted by national and regional governments, agencies, businesses and NGOs can be assessed on objective grounds. They effectively knit together to define an overarching paradigm of sustainability that is scientifically defensible. In short, they essentially reclaim the definition of sustainability from the loose 'definition drift' observed for the term 'sustainable development', restating it in an applicable and universally-relevant format. As such, they are also uncompromising as 'gatekeepers' of the sustainability concept.

Viewed from this perspective, it is possible to criticize the loose application of 'sustainable development' while maintaining a clear commitment to true sustainability. It requires no formalisation of new definitions, merely a commitment to a set of scientifically-derived principles or conditions. (We already have a deep-rooted societal consensus about the Laws of Thermodynamics, and these TNS principles merely extrapolate them to practical problems.) This also has the advantage of interlinking closely with precautionary approaches to environmental protection. It is under a precautionary paradigm that ecological systems will be best able to be protected or restored to a sustainable state from which all of human society, present and future, will ultimately benefit. Indeed, implicit within the application of TNS sustainability principles is the concept that restoration of natural and social capital enhances the overall 'carrying capacity' for people, communities and for sustainable business enterprises.

3 Ethics of Sustainability

The four TNS principles that define sustainability can also be used to define the ethics of living harmoniously with natural systems. If the principles are violated then a given activity must be 'wrong' in this context, both in terms of eroding natural carrying capacity as well as denying other people opportunity of access to natural resources.

The current fundamental conflict between ecological systems and human cultures does not mean that it is impossible for humans to co-exist with natural assemblages of organisms. It just means that this co-existence must be defined in the light of a new understanding of what is 'right' and what is demonstrably 'wrong' with respect to policy, technology and economic instruments brought to bear on the environment. This was the original intent behind the definition of 'sustainable development' in the 1987 'Brundtland Report', though the initial clarity has been muddled substantially in the intervening years. Today, we are well-placed to reclaim the primacy of the concept of 'sustainability' in guiding development, and to do so in ways that are informed by highly-developed and tested science.

Some environmental issues are being addressed in this way already by various NGOs. The problems have been identified and policies devised in a way which would result in clear moves towards sustainability if taken up by governments and other decision-makers and successfully implemented. For example, the production and use of energy and

chemicals and the management of fisheries are all areas in which NGOs have developed alternative visions and practical roadmaps, guided by both sustainability and precautionary principles.

An extremely positive signal of change at the international level is seen in the way that some policy instruments are changing. For example, where such international commitments historically often focused upon emission limits, with no linkage to environmental capacity, some more recent policy instruments are focusing now upon ecological or human health measures as integrators of environmental impact, or upon mandatory take-back or recycling targets for end-of-life products. However, we still have to be wary of old notions of 'development' constraining the ways in which such far-sighted instruments are transposed and implemented at the national level. The EU Water Framework Directive is a case in point, where the same 'dilution' effects as observed for 'sustainable development' are evident in the transposition of the Directive's grand vision into national interpretation and subsequent actions.

Based upon a consideration of just the above three areas of sustainability in energy, fisheries and chemicals, it is clear that numerous environmentally-related practices of human society have ethical implications. In other words, they are associated with a need to define them in terms of what can be regarded as 'right' or as 'wrong' in this context. Emergent ethics need to be gauged against sustainability principles if they are to guide us on a pathway to sustainability. This scientific basis is essential if the ethical position is not to be grounded instead in entrenched, ephemeral or divisive cultural, political or religious beliefs.

The development of renewable energy sources, the emplacement of a network of marine reserves, and the idea of zero-emissions of hazardous chemicals are all entirely consistent with the four principles of sustainability articulated as TNS System Conditions. Unfortunately, the ethical framework in which they have been assembled is not one which is universally shared, particularly by those with vested interests in any of the given areas. Importantly, this is not to say that it never will be shared. Indeed, the primary role of various NGOs, international bodies and others whose purpose is to promote truly sustainable human activities could be seen as one of promoting universal acceptance and application of better ethical standards, more suited to the challenges facing humanity and its future. Acceptance of the Precautionary Principle as a guiding principle and ethical metric has been slow, and is still incomplete. Increasing acceptance of precaution as a driver of mainstream environmental policy is testament to the fact that it is possible to change an ethical view and elements of the ethical framework from the bottom up. In no small measure this has been due to the work of the voluntary sector, through which impetus for deep societal change is commonly first manifested.

The lack of a shared ethos across all sectors of society is a primary factor allowing 'sustainability' as a term to be redefined in numerous ways with numerous definitions. It has been described thus:

- At one end of the spectrum it is a term used with precision, and according to the defining principles above.
- In the middle of the spectrum, it is a term added as a modifier to the names and titles of studies or practices, though not affecting underpinning (generally economic) decisions.
- At the other end of the spectrum the term is used merely as a placebo, or a justifier of 'business-as-usual'.
- In some cases it is used in a deliberately deceptive manner

It is therefore important that we accept a set of higher ethical standards in order to give substance to a vision of sustainability. To do this, it will be necessary to define ethics of sustainability which can be used as a metric of achievement and success in all areas of activity. This ethical framework needs, as a priority, to address the central issue of consequences in a world of total freedoms which yet remains, willfully or otherwise, ignorant of these consequences.

4 The Need for Higher Ethical Standards

It is possible to identify a large number of the current practices of human society which need to change in order to achieve sustainability within a relevant timeframe (one or two generations at the very outside). The priorities to be addressed in order to progress towards a better ethical position must include:

1. an economic system currently dependent on growth in material consumption within a world of finite resources;
2. displacement and physical/chemical degradation of planetary biological systems, both marine and terrestrial;
3. inequitable use of resources which result in benefits that accrue to few and costs to many (including future generations);
4. failure to recognize that the basic human rights for shelter, food and water are part of the natural cycle, for which all people require an equitable share of natural capital;
5. deprivation of access of current and future generations to natural capital through the destruction of ecosystems; and
6. failure to accept credible markers of global environmental change (biological, physical and chemical).

Each of these touches on one or more of the principles of sustainability. Identifying each of these as a wrongful action might result in a change to the prevailing ethical framework such that:

1. unrestrained free markets (actual and illusive) will cease to exist.
2. the systematic accumulation of mined and man-made materials in nature will be halted;
3. damage to ecological systems will attract severe penalties irrespective of malice aforethought on the part of those causing the damage;
4. current consumption patterns, skewed towards benefits to developed nations, will be considered unacceptable;
5. a systematic and ordered distribution of natural capital between human societies and natural systems governed by the precautionary principle will be developed;

6. ecological capital will be treated as more important than economic systems, as the latter are ultimately dependent upon the former. Degraded systems will be allowed (and encouraged) to recover; and
7. capacity to monitor the state of natural systems and potential degradation/collapse will be improved, with surveillance programmes informed and governed by the precautionary principle.

What is striking about the above list is, firstly, the key role of the Precautionary Principle (applied in recognition of the true uncertainties attached to ecosystem function), in avoiding damage to these ecosystems. Secondly, the pivotal need to change current economic systems and consumption patterns also stands out. Thirdly, the foundation provided by natural capital in supporting human needs and economic activities needs to be adequately reflected in attitude, action and economic instruments. In short, any economic system must be viewed as a subset of, and unavoidably dependent upon, the integrity of natural systems, rather than the other way round.

The significance of ongoing economic development is reinforced time and again in the literature as one of the primary drivers of environmental degradation (for example in the UN's Millennium Ecosystem Assessment, 2005, or Worldwatch Institute studies, or the Living Planet index employed by WWF and others). Beyond the ethic of the Precautionary Principle, those working on these issues are broadly seeking to change the current ethical framework to one based on sustainability ethics. In each case, the campaigns are seeking to undermine the *status quo* and install a changed set of ethical values which are evidence-based and both eco-centric and sustainable in intent. So, from a moral stance rooted in the thermodynamic and ecological realities of the world's underpinning life-support systems:

- Abuse of political or economic power, either in a national or international context, is wrong.
- Incautious, permissive environmental discharge regulation is wrong, as it does not steer society towards zero harmful emissions.
- Use of compounds that are relatively persistent and foreign to nature, outside of tightly controlled closed-loop systems, is wrong.
- Use of fossil fuel and other mined materials beyond natural re-assimilation rates (which operate over geological timescales) is wrong.
- Use of nuclear energy, given the accumulation of waste over long timescales and the concomitant costs imposed upon future generations, is wrong. An additional negative factor is the tight linkage of nuclear power to nuclear arms.
- Use of GE organisms in uncontained systems is wrong since it threatens to override natural barriers to gene flow.
- Over-fishing, forest destruction and over-abstraction are wrong as they irreversibly erode the natural capital upon which the global ecosystem and human wellbeing depends.
- Failure to investigate the compliance of current practices with System Conditions is wrong, since all participants

influence the system as a whole, and sustainability relies on each participant taking responsibility for the system as a whole.

To provide practical guidance, each issue area must also be defined in terms of what could be right, i.e. the solution consistent with the new ethic of sustainability. This is essential not only to provide positive guidance, but also to ensure that arguments in favour of sustainable change are strong. Evidence of the hidden costs of unsustainability and of the long-term advantages stemming from sustainable practices are accumulating, but have often been underplayed in the public arena.

Currently, the ethical message is generally at its most clear and robust in terms of the first three of the four principles of sustainability articulated by TNS. With respect to the fourth, which governs economic aspects including equity and, by association, some aspects of global governance, organisational positioning in the NGO and governance communities is less categorical. Nor have the revised ethical standards which need to be promoted around these issues been fully formulated and agreed. In part, this may be symptomatic of their origins in a different, non-biophysical discipline. However, hard biophysical realities stem from denial of opportunity or imposition of inequitable resource access in the absence of clear ethical guidance. Furthermore, the scientific authority of the biophysical model from which the TNS principles derive demonstrates that it is not necessary to redefine sustainability in order to emphasise this societal dimension.

5 Population, Affluence, Carrying Capacity and Catastrophes

Use of the concept of 'sustainability' as an overarching paradigm against which to position development raises some important questions. Consistently, when they can be tracked down, the drivers of ecological impact tend to lead in the same direction. The current situation with respect to human societies at a global level can be portrayed as a somewhat amorphous 'object' moving forwards through time into a narrowing 'funnel' of opportunities for sustainability, bounded at the lower side by fast growing population and at the upper side by fast diminishing resources. In effect, these boundaries, or walls of the 'funnel', describe a declining potential, with time, to maintain current economic activity and the societal structures it generates. Only by ensuring that the 'amorphous object' that represents human societies remains clear of both the upper and lower boundaries of the 'funnel' as it progresses through time can conditions for sustainability be maintained. Moreover, as time moves on, the boundaries converge, such that the maneuvering required to achieve sustainability becomes ever more complex the longer unsustainable conditions are allowed to persist. Furthermore, the human societies 'object' attempting to negotiate this 'funnel' is likely to be somewhat unevenly shaped, reflecting the inequities of access to, and consumption of, limited natural resources from region to region.

Hence, efforts which focus on lowering human environmental impact will inevitably need to attend to population distributions, resource consumption patterns and the distribution of affluence and privilege as key determinants of the ability of human societies as a whole to remain within the bounds of the 'funnel' of sustainability.

The importance of economics is once again emphasised, but always set against the finite supportive capacities of the global (and indeed local) ecosystem. It follows that catastrophes in the form of resource shortages are most likely, and the consequences of 'natural disasters' most severe, in areas where the natural capital has been most degraded. Recent events in the US have made clear that economic development does not necessarily confer of itself protection from the consequences of environmental degradation. Equally, the exacerbation of storm damage where the natural buffer of mangroves has been stripped away in pursuit of aquaculture in coastal regions of several developing nations exemplifies the hidden 'real' costs of unsustainable economic progress. However, this line of argument leads to some ethically difficult territory.

In the view of some people, for example, the global carrying capacity for humans has already been, or is close to being, exceeded. Viewing catastrophes as inevitably resulting from exceedence of carrying capacity in one domain or another (food or fossil fuels use), some even argue that such events should be left to play themselves out, irrespective of the regional human suffering.

"The ethics of resource allocation should not include enabling acts that ultimately lead to continually exceeding carrying capacity."

Such an approach may well lead only to a reinforcement of the flawed system perspective which led to carrying capacity being exceeded in the first place. Even in the most simplistic analysis, moreover, population distributions and trends cannot justifiably be considered as independent variables, to be identified as root causes of problems in themselves and, presumably, therefore amenable only to direct controls. Population trends are in large part influenced by the very same financial, social and ecological insecurities which they in turn perpetuate and exacerbate. It equally follows that measures to tackle those insecurities, through improved governance and infrastructure, are essential preconditions in beginning to address the local and regional demographics and impacts of population. Therefore, while some may seize all too readily on the need for enforced population controls, irrespective of national or social context, and others go to great lengths to avoid coming to the same uncomfortable conclusion, it seems inevitable that the beginnings of a real solution lie elsewhere in addressing the underlying problems which act as drivers for population growth and redistribution. Overall, the issues around current population, its growth and its growing per capita material expectations are coming to be seen as central to the debate on sustainability, and as issues which will need to be addressed regardless of the difficult political issues they raise.

6 Conclusions

The broad conclusions from this very brief treatment of sustainability are as follows:

1. The concept of 'sustainable development' has been devalued by weak redefinition to suit a wide range of interests and insistence on classical economic development being the driver.
2. The concept of 'sustainability' must therefore be reclaimed in unambiguous terms.
3. The four principles developed by The Natural Step (TNS) can help identify ethical issues which need to be addressed, freeing them from the dogma of non-scientific belief systems and providing a robust and authoritative framework from which to address contentious issues.
4. Economic ethics and global governance issues often confound durable solutions to sustainability problems, yet can be resolved by application of a robust set of sustainability principles.
5. Political instruments should be thoroughly rooted in and tested against sustainability principles if political leaders are genuinely to claim to be serving the public interest. Public policy across all areas should be tested against sustainability principles as a public service, else it may in the long term erode the potential of the people it is intended to serve.
6. Population growth is an area that needs to be addressed with respect to its influence on achieving sustainability, though needs to be addressed in terms of its causes.
7. The scientific basis provided by the four TNS System Conditions offers a robust and independent framework upon which policy and practice relative to sustainability can be developed and tested.

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