2.1: Environment and Sustainability

Making Sense of Sustainable Development

Sustainability is the buzzword of our time. Everyone from policymakers, to urban planners and retail executives seem to have adopted the term. It is the in-vogue prefix for anything from corporate environmental reports to travel agents’ package-tour promotions. To paraphrase economist Milton Friedman, we are all committed to sustainable development now. But what may be an advertiser’s dream can be a local authority’s nightmare. Is the concern with sustainability just a passing fad? Or does it signify an emergent cultural revolution? Do we all mean the same thing by sustainability or sustainable development? Do we all share the same premises and have the same goals? Or will different interpretations and different agendas result in conflicting policy interpretations, priorities and practices? Given the welter of confusion surrounding the concept, many local authorities might be forgiven for dismissing the validity or utility of the concept as an unnecessary complication for their work. This chapter unpacks the concept of sustainability. Writ large, the concept alludes not only to the ecological crises at hand but to wider social, political, and cultural challenges which will require the development of new methods, skills, and attitudes. Clarity on the subject, and the values, premises and agendas that lie tucked behind it, is essential to the accomplishment of sustainability goals. To a large degree this area of critical analysis has been left neglected in the stampede to jump aboard the sustainable development bandwagon. Critics argue that for sustainable development to be regarded merely as the sumnum bonum of human existence is to render it meaningless. The trade-offs and choices implicit in the ‘search for sustainability’ must be made transparent to generate widespread popular support for the need for transformation. There will no doubt be winners and losers in the process and this must be communicated honestly to prevent future conflicts. These and other themes are touched on in this chapter and recur in the rest of the text. This chapter concerns itself with the questions: What are the issues driving the sustainability movement? What are the controversies? And what do they mean?
Taking The Long View: Sustainability in Evolutionary and Ecological Perspective

In evolutionary terms there is no such thing as sustainability — at least as far as our species is concerned. Of the different forms of life that have inhabited the Earth in its four thousand million year history, 99.9% are now extinct. Against this backdrop, the human enterprise with its roughly 300,000-year history barely merits attention. As Mark Twain, the American novelist once remarked, if our planet's history were to be compared to the Eiffel Tower, human history would be a mere smear on the very tip of the tower. But while modern humans (Homo sapiens sapiens) might be insignificant in evolutionary terms, we are by no means insignificant in terms of our recent planetary impact. A 1986 study estimated that 40% of the product of terrestrial plant photosynthesis — the basis of the food chain for most animal and bird life — was being appropriated by humans for their use. More recent studies estimate that 25% of photosynthesis on continental shelves (coastal areas) is being used to satisfy human demand. Human appropriation of such natural resources is having a profound impact upon the millions of other species which are also dependent upon them. Ecologist, William Catton has estimated that current rates of human resource extraction are 10,000 times the rates of natural resource regeneration; these are showing no signs of abating. More worrying still is the fact that human impact appears to be placing the planet itself into reverse gear. One of the basic tenets of evolution is that the generation of new forms of life outstrips the extinction of older species by a wide margin thus ensuring strong biological diversity. Scientists believe, however, that for the first observable time in evolutionary history, another species — Homo sapiens sapiens — has upset this balance to the degree that the rate of species extinction is now estimated at 10,000 times the rate of species renewal. Human beings, just one species among millions, are literally crowding out the other species we share the planet with. Evidence of human interference with the natural world is visible in practically every ecosystem from the presence of CFCs in the stratosphere to the artificially changed courses of the majority of river systems on the planet. It is argued that ever since they abandoned nomadic, gatherer-hunter ways of life for settled societies some 10,000 years ago, humans have continually manipulated their natural world to meet their needs. While this observation is a correct one, the rate, the scale and the nature of human-induced global change — particularly in the post-industrial period — is unprecedented in the history of life on Earth.

There are three primary reasons for this.

Firstly, mechanization of both industry and agriculture in the last century resulted in vastly improved labor productivity which enabled the creation of goods and services. Since then, scientific advance and technological innovation — powered by ever-increasing inputs of fossil fuels and their derivatives — have revolutionized every industry and created many new ones. The subsequent development of western consumer culture, and the satisfaction of the accompanying disposable mentality, has generated material flows of an unprecedented scale. The Wuppertal Institute estimates that humans are now responsible for moving greater amounts of matter across the planet than all natural occurrences (earthquakes, storms, etc.) put together.

Secondly, the sheer size of the human population is unprecedented. There are more people alive today than there have been in all human history. Every passing year adds another 90 million people to the planet. Even though the environmental impact varies significantly between countries (and within them), the exponential growth in human numbers, coupled with rising material expectations in a world of limited resources, has catapulted the issue of distribution to prominence. Global inequalities in resource consumption and purchasing power mark the clearest dividing line between the have and the have-nots. It has become apparent that present patterns of production and consumption
are unsustainable for a global population that is projected to reach between 12 billion by the year 2050. If ecological crises and rising social conflict are to countered, the present rates of over-consumption by a rich minority, and under-consumption by a large majority, will have to be brought into balance.

Thirdly, it is not only the rate and the scale of change but the nature of that change that is unprecedented. Human inventiveness has introduced chemicals and materials into the environment which either do not occur naturally at all, or do not occur in the ratios in which we have introduced them. These persistent organic pollutants are believed to be causing alterations in the biosphere and geo-chemical cycles, the effects of which are only slowly manifesting themselves, and the full scale of which is beyond calculation. CFCs and PCBs are but two examples of the approximately 100,000 chemicals currently in global circulation. (Between 500 and 1,000 new chemicals are being added to this list annually.) The majority of these chemicals have not been tested for their toxicity on humans and other life forms, let alone tested for their effects in combination with other chemicals. These issues are now the subject of special UN and other intergovernmental working groups.

The Significance of Such Biospheric Intervention

The cumulative effects of these human interventions are gradually beginning to manifest themselves. Collectively these phenomena signify a major discontinuity, a tectonic shift in our relation with the biosphere. In terms of their message, they amount to what Norman Myers calls 'a whole flock of miner’s canaries singing with decibels of warnings.' As Clive Ponting, the historian, has noted, humans are distinct from all other species in their relationship to the ecosystem in two ways. ‘First, they are the only species capable of endangering and even destroying the ecosystems on which they depend for their existence. Second, humans are the only species to have spread into every terrestrial ecosystem and then, through the use of technology, to have dominated them.’

Recent human development patterns have not only affected ecological systems but are also rapidly changing social systems. Arguably, two of the most powerful forces of societal change in modern times have been:

- colonialism, with its lasting legacy of unequal political and economic relations between and within countries; and
- scientific and technological development, which has changed virtually every aspect of contemporary life.

These and other forces have contributed to a highly polarized world where disparities in wealth and income (see Figure below).
Power and status, are deepening and continue to be marked by differences in, inter alia, gender, race and ethnicity, and national origin. Viewing the human predicament in ecological and evolutionary perspective is fundamental to an understanding of the significance of current changes. Taking the long view shatters the complacency of business-as-usual attitudes that ‘unsustainability’ is just a phase humanity is going through. Despite the complexity and uncertainty of global changes, there appears to be scientific consensus on most of the following three points:

1. first, the magnitude of the impact that humans, a juvenile species in evolutionary terms, are exerting on life-support systems;
2. second, as Gaia theoreticians — who view the planet as a self-regulating system — point out: the Earth is indifferent to humans, it will ultimately recover, even though the timescale will be eons;
3. the need for change to ensure a future for human beings.

The Evolution of Sustainability Itself

While Our Common Future, the report of the World Commission on Environment and Development (commonly known as the Brundtland Commission) is widely credited with having popularized the concept of sustainable development, it does in fact have a longer lineage. The year 1972 was a watershed in marking both the first International Conference on the Human Environment in Stockholm and the publication of the provocative report Limits to Growth by the Club of Rome which highlighted the imminent threat of ‘overshoot’ (a systems-analysis term for exceeding the carrying capacity). Throughout the 1970s and 1980s a steady stream of books and reports began to appear, preoccupied with the question of environment and development. This stream would turn into a deluge in the sustainability friendly 1990s. The World Conservation Strategy, the manifesto published collectively in 1980 by the World Conservation Union ([IUCN](https://www.iucn.org/)), the United Nations Environment Program ([UNEP](https://www.unep.org/)) — set up after the Stockholm conference), and the World Wide Fund for Nature ([WWF](https://www.iucn.org/)), stands out as an early — but at the time largely overlooked — international attempt at mobilizing public action to address emergent environmental challenges.
(Selected) Definitions of Sustainable Development

**Our Common Future** (Brundtland Commission Report), World Commission on Environment & Development, 1987

1. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

2. ... sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the orientation of the technological development, and institutional change are made consistent with future as well as present needs.

**Caring for the Earth** (IUCN, WWF, UNEP, 1991) Sustainable development means improving the quality of life while living within the carrying capacity of supporting ecosystems.

**Maastricht Treaty on European Union** (Article 2, Treaty on European Union, 1992) (Sustainable development is) a harmonious and balanced development of economic activities, sustainable and non-inflationary growth respecting the environment.

**Blueprint for a Green Economy** (‘Blueprint 1’). David Pearce, et al (1989), Earthscan, London Weak Sustainability: Only the aggregate of stocks of capital, regardless of their type, has to be held constant for future generations; these forms of capital are completely substitutable for each other. ‘It is the aggregate quantity that matters and there is considerable scope for substituting man-made wealth for natural environmental assets’

More recently, environmentalists have argued that the intellectual history of the concept of sustainability can be traced back to the terms ‘stationary’ or ‘steady-state economy’ used by 19th century political economists. For John Stuart Mill, the 19th-century political economist, ‘stationary’ was not a static concept but referred to a balance between production and natural resources implying equality of access to natural resources for successive generations. These concerns are not only to be found in dissident western intellectual traditions but can be traced in the oral histories of indigenous cultures. For example, the principle of intergenerational equity is captured in the Inuit saying, ‘we do not inherit the Earth from our parents, we borrow it from our children’. The Native American ‘Law of the Seventh Generation’ is another illustration. According to this, before any major action was to be undertaken its potential consequences on the seventh generation had to be considered. For a species that at present is only 6,000 generations old, and whose current political decision-makers operate on time scales of weeks, or five years at most, the thought that other humans have based their decision-making systems on time scales of 300 years seems inspiringly sage but politically inconceivable.

**Conflicts and Controversies**

At the beginning of this chapter the observation was made that sustainable development is not a self-evident concept but a politically contested one. Despite a plethora of varying definitions, at its core, sustainability refers to three simple concerns:

- the need to arrest environmental degradation and ecological imbalance;
- the need not to impoverish future generations;
- the need for quality of life and equity between current generations.

Added up, these core concerns are an unmistakable call for transformation. Business-as-usual is no longer an option. Social institutions — including economic systems and political arrangements — cannot continue as they are. This is not
an agenda for the faint-hearted. Little wonder then that ever since Our Common Future popularized what had hitherto existed on disciplinary margins or NGO agendas, there has been an avalanche of books, reports, and articles on the subject, addressing sustainable development from every conceivable angle. In the ensuing war of definition, almost 300 different interpretations of the concept have been identified. These differing — sometimes conflicting — interpretations are not accidental. They are the products of conflicting worldviews, differing ideologies, varied disciplinary backgrounds, opposing knowledge traditions, value systems and vested interests. Such differences in understanding and approach make consensus towards common agendas difficult.

Furthermore, in a sharply divided world it is not uncommon for the rich and powerful to have one agenda; and the poor and under-privileged to have another. Why the need for conceptual clarity? But why does this matter? Is it not futile to quibble over conceptual definitions when the key issue is to devise strategies and set targets to put the concept into practice? While action is urgently needed, understanding the concept and agreeing upon principles for action is paramount. Two examples bring this point home. The first is from Canada, one of the first countries to embrace ‘sustainable development’ as official national policy. In 1992 a three-volume survey of how Canadian municipalities were attempting to translate sustainability in the urban context found a spectrum of definitions of sustainable development formulated by municipal officials. The author concluded that the exercise underscored how ‘poorly the concept is understood and put to practice, despite all the rhetoric since the Brundtland report’.

The second example comes from the UN Secretary-General’s review of global progress on sustainable development since UNCED. The report notes that one of the constraining factors to further progress has been that: ‘... not all Governing Bodies of international organizations, even within the UN system, have the same understanding of the concept of sustainable development. Some have adopted programs of environmentally sustainable development, others have called for sustainable human development while others have talked of conservation or other types of environmental plans. This has led to some confusion regarding the core issues of sustainable development.’

Evidently, clarity about the concept is crucial when it comes to selecting which issues are to be emphasized, whose needs and interests are to be prioritized, and who is to be involved in the decision-making. This in turn informs what framework is to be set and what policies and instruments are to be employed. Such considerations matter because the defining of issues and the negotiation of interests is not an apolitical process, it is an intensely political one. Several analysts have emphasized this point: ‘... the realization of environmentally sustainable strategies is not simply a problem of technology or ecosystemic understanding, but of politics, institutions and the articulation and implementation of public policy’.

Two controversial examples serve to illustrate this point of the power of definition and, subsequently, policy formulation.

**What is more uns sustainable: population growth or car growth?**

The first case relates to those two favorite bogies of many environmentalists: population growth and cars. Population growth rates, in relation to available resources, have long been held to be a key source of environmental degradation. Population control has therefore been a central focus of many international aid programmes, which use an assortment of incentives and inducements to lower fertility in poor countries. Car growth, on the other hand, is growing four times as fast as the human population. There are, however, no population control programmes for cars. Traffic growth targets are seldom set (or seriously implemented) and policy makers seem incapable of arresting the inexorable growth in private vehicles. Experience has shown that restrictions have been opposed by the automobile industry and western consumers.
alike as an attack on free trade and personal freedoms respectively. Critics charge that it is therefore evidently easier to control the fertility of the poor in Southern countries than the mobility of car-dependent consumers in Northern countries. Such policy choices beg the question: whose interests are being served, and at whose cost?

**Whose Common Future?**

The case of Our Common Future is also instructive here. While the report is credited for catapulting the issues of environmental degradation and unequal development onto the international stage, it was also profoundly critiqued for its ambiguity and unwillingness to draw out the policy implications of its own analysis. It condemned the environmental impact of economic growth; but called for more growth. It deplored growing inequality in the world; but was silent on resource distribution. Critics charged that the report sought to be 'all things to all people', obscuring real world issues of power, conflict, and responsibility. While some people identified it with the message of ecological integrity, economic transformation and social justice, others identified it with the promise of sustained growth, that it was possible to be 'green and rich at the same time'. No doubt any report that was endorsed by free-market Heads of State and antipoverty activists alike was bound to suffer from some degree of schizophrenia. In sum, the impassioned debates surrounding the Brundtland Commission report, and the political confrontations at the later Earth Summit (Rio 1992), underscore the fears and divisions at the heart of the sustainability debate. It is these that are driving — or hindering — different sustainability agendas.

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**The Flashpoints**

If the core elements of sustainability — ecology, economy, and equity — be regarded as the tips of a triangle, then it is the relationship between ecology and economy, and economy and equity respectively, that constitute the flashpoints in the sustainable development debate. More specifically, the themes are: the weakness of economic models, the nature of growth, the culture of consumption, and equity.

**Environment or Economy?**

Perhaps the most evident clash of interests and competing worldviews is between ecologists and economists. In everyday life, sustainability choices are typically described as being about economic growth or environmental quality, conservation or jobs. Framed in such a way, it is no secret that precedence is usually given to immediate economic needs. Critics argue, however, that the choice is a false one: the environment is not only the 'long-term economy' but a healthy environment is a precondition for a healthy economy. The competitive edge gained by those countries who have shrewdly invested in strong environmental standards and nurtured ecologically responsible industry supports this point. Nevertheless, there is no fudging the very real differences that lie at the heart of the environment-economy dispute. Ecologist Bill Rees argues that sustainability is a 'more complex problem from the ecological perspective than it appears to be from the economic mainstream'.

Expansion-orientated business and industry call for ‘sustained growth’ environmental scientists scorn such notions in a world of limited resources and oppose ‘unfettered expansion of economic activity in rich nations’. As one green economist states: ‘the conflict between current economic growth patterns and sustainability constraints hardly needs to be argued: it is the whole basis of the environmental crisis. If current patterns of economic growth were simply to continue ... environmental degradation will get worse’.

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In recent years there has been strong criticism of mainstream (neo-classical) economics for its short-sightedness on environmental and social (e.g. equity, gender and culture) factors. This failing is not only inefficient, it leads to the ‘externalizing’ — or passing on to society or future generations — of environmental and social costs. Economic indicators such as GNP have also come under fire for their inadequacies in guiding ecologically viable economic policy. Above all it is the nature of growth, and the demands of a consumer culture for it — ‘the notion that the role of a human being is to maximize his or her consumption’— that are irreconcilable with ecological objectives of respecting biospheric integrity in a context of rising population, rising consumerism, and rising environmental stress. It is this last issue that remains one of the central flashpoints in the environment-economy link. Positive steps towards a more balanced and ecologically sound relationship are, however, being made. For example, the development of industrial ecology with its focus on a circular rather than a linear economy, has found a receptive ear in progressive industry circles. Strides are being made in several areas to increase resource and energy productivity (make ‘more with less’) by factors of 4 to 10. These are being advocated by research institutes, lobbying associations and the European Commission to reduce both ‘input’ and ‘throughput’ in the economy. The discipline of economics itself is slowly being transformed by practitioners bringing in new thinking on ecological and social connections. For example, recent theorizing has focused on the need to maintain and enhance ‘natural capital’: the objective being to live off the income rather than deplete stocks. More generally, the environment-economy link has become part of political debate; it has even become fashionable to talk in terms of the ‘triple bottom line’: environment, economics and equity. Institutions such as the World Bank have also established units to study the challenges of environmentally sustainable development.

**Equity**

While much progress is being made to improve resource efficiencies, far less progress has been made to improve resource distribution. Currently, just one-fifth of the global population is consuming three-quarters of the earth’s resources (see Figure below). If the remaining four-fifths were to exercise their right to grow to the level of the rich minority it would result in ecological devastation. So far, global income inequalities and lack of purchasing power have prevented poorer countries from reaching the standard of living (and also resource consumption/waste emission) of the industrialized countries.
Countries such as China, Brazil, India, and Malaysia are, however, catching up fast. In such a situation, global consumption of resources and energy needs to be drastically reduced to a point where it can be repeated by future generations. But who will do the reducing? Poorer nations want to produce and consume more. Yet so do richer countries: their economies demand ever greater consumption-based expansion. (Parallel conflicts of interest can also be found at the local and national level.) Such stalemates have prevented any meaningful progress towards equitable and sustainable resource distribution at the international level. These issue of fairness and distributional justice remain unresolved, but high on the political agenda. It has both biophysical, social and economic dimensions. The social dimensions are the most politically contested and the assumptions lying behind talk of environment, development, equity, and sustainability need to be interrogated before a commonality of interests can be assumed. In practical terms this means that depending on the interpretation, policy choices could favor (one or in combination): technocratic solutions; (re)distributive measures; market-based instruments; individual value and lifestyle changes; or wide-scale economic and institutional reform.

**Concepts in Environmental Science**

**The Ecological Footprint**

The Ecological Footprint (EF), developed by Canadian ecologist and planner William Rees, is basically an accounting tool that uses land as the unit of measurement to assess per capita consumption, production, and discharge needs. It starts from the elementary assumption that ‘every category of energy and material consumption and waste discharge requires the productive or absorptive capacity of a finite area of land or water. If we (add up) all the land requirements...
for all categories of consumption and waste discharge by a defined population, the total area represents the Ecological Footprint of that population on Earth whether or not this area coincides with the population’s home region.

Land is used as the unit of measurement for the simple reason that ‘Land area not only captures planet Earth’s finiteness, it can also be seen as a proxy for numerous essential life support functions from gas exchange to nutrient recycling … land supports photosynthesis, the energy conduit for the web of life. Photosynthesis sustains all important food chains and maintains the structural integrity of ecosystems.’

Although the size of an Ecological Footprint, also termed Appropriated Carrying Capacity (ACC) would vary according to socioeconomic and technological factors one point is constant: the flows and capacities ‘occupied’ by one population are not available for another as these resources are finite. What does the Ecological Footprint tell us? Ecological footprint analysis can tell us in a vivid, ready-to-grasp manner how much of the Earth’s environmental functions are needed to support human activities. It also makes visible the extent to which consumer lifestyles and behaviours are ecologically sustainable calculated that the Ecological Footprint of the average American is – conservatively – 5.1 hectares per capita of productive land. With roughly 7.4 billion hectares of the planet’s total surface area of 51 billion hectares available for human consumption, if the current global population were to adopt American consumer lifestyles we would need two additional planets to produce the resources, absorb the wastes, and provide general lifesupport functions.

Ecological footprints have been calculated for numerous nations, cities, communities, and even individuals. The London-based IIED has calculated that London’s ecological footprint is 120 times the size of the city. The footprint of the average Dutch person is slightly less at 3.3 hectares per capita but still import ‘land services’ fifteen times the territory of the Netherlands itself. The message of the ecological footprint is that lifestyles and behaviour, industrial production and trade, institutions and politics must change. Humanity must learn to live off the income of the ‘natural capital’, and maintain natural stocks rather than continuing to mine them. Wackernagel and Rees suggest that one way would be to focus ‘more on living locally than on consuming globally.

Connectivity

We live in a world characterized by connectivity, that is, bycomplex chains linking our everyday lives to distant strangers and ecosystems in far flung regions of the earth, we have no choice. In the end, we must adapt our thinking to a complex, connected model of the world and our place in it. Persisting with only simple, consumerist frames of understanding—“I look great!” “This tastes delicious!”—for a complex world of remote impacts and finite resources renders us increasingly vulnerable to episodes of what ecologists call system collapse, that is, to the sudden breakdown of ecosystem services we rely upon for our life’s staple provisions. In the early twenty-first century, vulnerability to these system collapses varies greatly according to where one lives. A long-term drought in India might bring the reality of aquifer depletion or climate change home to tens of thousands of people driven from their land, while the life of a suburban American teenager is not obviously affected by any resource crisis. But this gap will narrow in the coming years. Overwhelming scientific evidence points to rapidly increasing strains this century on our systems of food, water, and energy provision as well as on the seasonable weather to which we have adapted our agricultural and urban regions. In time, no one will enjoy the luxury of remaining oblivious to the challenges of sustainability. Drought, for example, is one of the primary indices of global ecosystem stress, and arguably the most important to humans.
Precautionary Principle

The precautionary principle is central to environmental sustainability. A 1998 consensus statement characterized the precautionary principle this way: “when an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically”.

The precautionary principle has arisen because of the perception that the pace of efforts to combat problems such as climate change, ecosystem degradation, and resource depletion is too slow and that environmental and health problems continue to grow more rapidly than society’s ability to identify and correct them. In addition, the potential for catastrophic effects on global ecologic systems has weakened confidence in the abilities of environmental science and policy to identify and control hazards. There are also the apparent contradictions of our regulatory process: if the laws governing toxic chemical release are effective, then why are mercury levels in freshwater fish so high that pregnant women should not eat them? How is it possible that human breast milk may not meet U.S. Food and Drug Administration contaminant limits for baby food? The great complexity, uncertainty, and potential for catastrophe from global climate change are among the strongest motivators for those urging precaution in environmental policy. The precautionary principle, by calling for preventive action even when there is uncertainty, by placing the onus on those who create the hazard, and by emphasizing alternatives and democracy, is viewed by environmentalists as a way to shift the terms of the debate and stimulate change.

The precautionary principle seeks to minimize the limitations of a risk assessment based regulatory policy by encouraging a search for alternatives whenever a potentially hazardous chemical is identified. If a clearly safer alternative exists, why accept even a small, highly uncertain risk? The Danish Environment Agency used just this logic in taking action to eliminate phthalates from toys. They said, in essence, that there is exposure to these compounds, there is animal toxicity data, the exposure is to children who by definition are particularly susceptible to many toxic substances, there are alternatives, and the product serves no necessary function. Considering all these factors, they concluded that the plasticizer should not be used in toys.

Challenges to Environmental Sustainability

Organizations such as the World Commission on Environment and Development, the Millennium Ecosystem Assessment, and several others including the Intergovernmental Panel on Climate Change, the Organization for Economic Cooperation and Development, and the National Academy Report to Congress have all issued reports on various aspects of the state of society and the environment. The members of these groups are among the best experts available to assess the complex problems facing human society in the 21st century, and all have reached a similar conclusion: absent the enactment of new policies and practices that confront the global issues of economic disparities, environmental degradation, and social inequality, the future needs of humanity and the attainment of our aspirations and goals are not assured.

Some Indicators of Global Environmental Stress

Forests—Deforestation and degradation remain the main issues. 1 million hectares of forest were lost every year in the decade 1980-1990. The largest losses of forest area are taking place in the tropical moist deciduous forests, the zone
best suited to human settlement and agriculture; recent estimates suggest that nearly two-thirds of tropical deforestation is due to farmers clearing land for agriculture. There is increasing concern about the decline in forest quality associated with intensive use of forests and unregulated access.

**Soil** — As much as 10% of the earth’s vegetated surface is now at least moderately degraded. Trends in soil quality and management of irrigated land raise serious questions about longer-term sustainability. It is estimated that about 20% of the world’s 250 million hectares of irrigated land are already degraded to the point where crop production is seriously reduced.

**Fresh Water** — Some 20% of the world’s population lacks access to safe water and 50% lacks access to safe sanitation. If current trends in water use persist, two-thirds of the world’s population could be living in countries experiencing moderate or high water stress by 2025.

**Marine fisheries** — 25% of the world’s marine fisheries are being fished at their maximum level of productivity and 35% are overfished (yields are declining). In order to maintain current per capita consumption of fish, global fish harvests must be increased; much of the increase might come through aquaculture which is a known source of water pollution, wetland loss and mangrove swamp destruction.

**Biodiversity** — Biodiversity is increasingly coming under threat from development, which destroys or degrades natural habitats, and from pollution from a variety of sources. The first comprehensive global assessment of biodiversity put the total number of species at close to 14 million and found that between 1% and 11% of the world’s species may be threatened by extinction every decade. Coastal ecosystems, which host a very large proportion of marine species, are at great risk with perhaps one-third of the world’s coasts at high potential risk of degradation and another 17% at moderate risk.

**Atmosphere** — The Intergovernmental Panel on Climate Change has established that human activities are having a discernible influence on global climate. CO$_2$ emissions in most industrialized countries have risen during the past few years and countries generally failed to stabilize their greenhouse gas emissions at 1990 levels by 2000 as required by the Climate Change convention.

**Toxic chemicals** — About 100,000 chemicals are now in commercial use and their potential impacts on human health and ecological function represent largely unknown risks. Persistent organic pollutants are now so widely distributed by air and ocean currents that they are found in the tissues of people and wildlife everywhere; they are of particular concern because of their high levels of toxicity and persistence in the environment.

**Hazardous wastes** — Pollution from heavy metals, especially from their use in industry and mining, is also creating serious health consequences in many parts of the world. Incidents and accidents involving uncontrolled radioactive sources continue to increase, and particular risks are posed by the legacy of contaminated areas left from military activities involving nuclear materials.

**Waste** — Domestic and industrial waste production continues to increase in both absolute and per capita terms, worldwide. In the developed world, per capita waste generation has increased threefold over the past 20 years; in developing countries, it is highly likely that waste generation will double during the next decade. The level of awareness regarding the health and environmental impacts of inadequate waste disposal remains rather poor; poor sanitation and waste management infrastructure is still one of the principal causes of death and disability for the urban poor.