Sustainability: From Concept to Practice

Nature is reacting to the activities of industrial societies in unanticipated and surprising ways. The prospect of global climate change, the thinning of stratospheric ozone, the increasing acidification of rain, snow, and even large bodies of water, and the steady decline in biodiversity have all been linked to the spread of industrial development. Yet the predominant view until recently has been that human activity had little, if any, determinative role in the natural order. Instead, "nonliving forces like volcanic eruptions, severe storms, drought, and even drifting continents" were thought to cause global change [1]. Now scientists are increasingly persuaded of the critical impact of human activities on the natural order. Nicholas Schakleton, a climatologist at Cambridge University, has suggested that industrial impacts on the environment have resulted in our "going outside what nature has experienced in the recent past 500 000 years" (*New York Times*, Jan. 16, 1990). While the precise magnitude and dynamics of society's impact on the natural order will remain the subject of much debate, it is increasingly recognized that the effect is sizable and, in many instances, destructive.

This special issue of *IEEE Technology and Society Magazine* takes up the challenge of articulating an alternative technological pathway that can improve society's relationship with the natural environment. The new pathway draws upon one of the most important ideas of the late twentieth century: sustainable development. Thanks to the 1987 report *Our Common Future,* authored by the World Commission on Environment and Development (WCED) [2], and the 1992 Earth Summit in Rio de Janeiro, Brazil [3], the concept of sustainable development has become the standard bearer for efforts to redefine technology and society in more environmentally thoughtful, conserving, and equitable ways. Contributors to this issue are participants in a worldwide initiative to move the concept of sustainable development from an insightful way of thinking to a mode of social practice.

For nearly 25 years, natural and social scientists, development planners, and technologists have worked vigorously to hone the concept [4]. The contemporary effort can be dated from the 1972 book, *The Limits to Growth,* issued by the Club of Rome [5]. Using projections of existing growth rates in population and the consumption of natural resources, the volume concluded that humanity would reach the material limits of several key resources by the mid-twenty-first century and exhaust the "carrying capacity" of the planet. While criticized by many for its neo-Malthusian assumptions, the book nonetheless brought into focus problems in nature–society relations which, if ignored, could be ecologically and socially costly.

Picking up on the idea of carrying capacity, the International Union for the Conservation of Nature and Natural Resources published its 1980 report, *World Conservation Strategy* [6]. With this document, the argument moved beyond the issue of physical, finite limits to include the delicate, diverse, and evolving web of life. Living within our means would require, according to the International Union, not only a recognition of material limits but the conservation of species, habitats, and their interactions. Our

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challenge became ecological as well as material.

Alongside this work, two United Nations sponsored commissions headed by, respectively, former West German Chancellor Willy Brandt and former Swedish Prime Minister Olav Palme, criticized the highly unequal pattern of development that had emerged in the post-World War II period. Reports of both commissions [7], [8] urged the world community to commit itself to eliminate absolute poverty and to establish an explicit strategy to achieve parity in economic development by the twenty-first century.

These two threads of concern, ecological balance and social equity, were joined by the WCED in its definition of sustainable development [2, p. 8]:

"Humanity has the ability to make development sustainable — to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept ... does imply limits — not absolute limits, but limits imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities ... The Commission believes that widespread poverty is no longer inevitable. Poverty is not only an evil in itself, but sustainable development requires meeting the basic needs of all and extending to all the opportunity to fulfill their aspirations for a better life. A world in which poverty is endemic will always be prone to ecological and other catastrophes."

The Commission summoned the scientific, technological, business, and political leadership of our era to turn sustainability into a reality, declaring that "technology and social organization can be both managed and improved to make way for a new era" [2, p. 8].

At the Earth Summit, the world community began the process of operationalizing the WCED's idea of sustainability. A pledge was secured from wealthy countries to slow down greenhouse gas emissions. North and South agreed to take steps to reverse the decline in biodiversity. And nations committed themselves to forge new development partnerships that meet social needs as an integral part of the agenda to restore ecological balance [3].

Many voices have praised accomplishments to date in the arena of sustainable development. Certainly, praise is due those who have brought forward new technologies and modes of social organization that reduce materials use, minimize waste generation and advance our utilization of renewable resources. Yet, a basic question remains: will we actually accept the need to live within our environmental means and do so equitably? Will we, for example, translate resource savings into lower consumption among wealthy countries and the elimination of poverty? Or, will we spend such savings on new "needs" in high-consumption societies and thereby deepen long-term ecological and social unsustainability? This issue cannot be resolved by technological or organizational "fixes."

When confronted with this problem, all too often environmentalists and technologists alike respond with appeals to manage our natural and social resources better. But this, ultimately, is not an answer. It holds out hope that we can use and consume more by being more efficient. In fact, the WCED falls into precisely this trap when it promises that the new era will be one of growth as a result of improved social and ecological management.

As Herman Daly has noted, this merely perpetuates an oxymoron, the idea of "sustainable growth" [9, p. 45]:

"The Earth's ecosystem develops (evolves), but does not grow. Its subsystem, the economy, must eventually stop growing, but can continue to develop. The term 'sustainable development' therefore makes sense for the economy, but only if it is understood as 'development without growth' ... Currently the term 'sustainable development' is used as a synonym for the oxymoronic 'sustainable growth.' It must be saved from this perdition."

True sustainability requires the recognition that we cannot grow endlessly to meet our needs. We must, instead, develop within our ecological means, meeting the needs of the present and future equitably.

References

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