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Challenge and response

Albert Toynbee, in his monumental study of world history, used the concepts of “Challenge and Response” to explain how civilizations rise and fall. He felt that traditional explanations – environment, race, leadership, possession of land, access to natural resources – were wrong or too narrow. Instead, he looked for the underlying cause that explained societal success or failure. By “challenge” Toynbee meant some unpredictable factor or event that posed a threat to the ways in which a group of people had made their livelihood in the past. But “challenge” was not all negative. It carried in it the germ of opportunity. “Response” was the action taken by the same group of people to cope with the new situation. A challenge would arise as the result of many things – population growth, exhaustion of a vital resource, climate change. It was something that nobody had knowingly created. Response required vision, leadership, and action to overcome the threat and create a basis for survival and, hopefully, prosperity.

Because he analyzed large civilizations, Toynbee reserved the terms “challenge and response” for major threats and actions that impacted the well-being of the entire population. “Challenge” threatened the very survival of the existing system. “Response” would range from inaction to major change in the living conditions of individuals as well as the group. It could embody new technology, social organization, and economic activities, or a combination of various factors. “Response” was never predictable, and its outcome would only be known over time. This was the risk humans took – resulting in success or failure.

One of the examples used by Toynbee to describe the rise and fall of civilizations is the emergence of agriculture and cities in the ancient Near East. The challenge, in this case, was a regional shift in rainfall patterns.

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North Africa, Egypt and Mesopotamia were no longer tracked by Atlantic storms which, for unknown reasons, moved further north. With less rain the traditional lifestyle of hunters and gatherers in this region could no longer be supported. Several response strategies emerged. Some people did nothing. They held on to their old ways, and eventually perished. Others migrated to find more amicable climatic conditions, and remained hunters and gatherers. But a few people survived, and even prospered, in the new environment by “inventing” the domestication of plants and animals, irrigated agriculture, and cities – the civilizations of Egypt and Sumer were born.

Critics of Toynbee have pointed out that the story is based on now dated archaeological evidence. Therefore, the chain of events leading to agriculture and urbanization may well have been different. Yet, Toynbee’s categories of “Challenge and Response” are useful for understanding social change. They allow us to focus on important dimensions of change that will help us understand today’s challenges.

First, major challenges arise infrequently. They are driven by transformation in environment, technology, economy, and society. The industrial revolution was one such challenge. Karl Polanyi spoke of “The Great Transformation” from agrarian to industrial society. During the industrial age three large transformations have taken place. None was as revolutionary as the end of the agrarian age, but each was powerful enough to spawn wars, revolutions, and massive social dislocations. And each eventually succeeded in creating jobs and livelihoods for larger numbers of people. The first hundred years of the transition was focused on access to raw materials. The next stage was dominated by the manufacture of finished goods. And now the world is undergoing another round of massive change through the global powers of knowledge and information.

Transformations of this magnitude break with the past in ways that go far beyond the normal process of change that occurs from generation to generation. It is understandable, therefore, that people feel threatened by change and want to resist it. Only a few have the vision to see necessity as well as opportunity in the midst of suffering and destruction.

Second, multiple responses are possible. All of them, including the option of inaction, carry risks and unknown outcomes. Not to act, at least for a while, actually seems more attractive to most, but eventually may claim the highest price.

Third, a successful response must be bold enough to overcome the

threat and show a path to the new land. This requires strong leadership. Yet the leaders must also make the new vision acceptable to the majority of people. This condition is paramount in a democratic society. Unless a majority is found to support the new way, the solution will be unacceptable. Thus, the social process of transitioning from old to new conditions is critically important.

Finally, responses have a better chance of success if they allow for mid-course corrections. Large blueprints are inflexible and lead to social confrontation instead of bringing people together in pursuit of common goals.

Change in our time is closely associated with the emergence of a global economy dependent on rapid flows of information, technology, and capital. Benefits are large. But so are unintended consequences – economic, social and environmental. Economic globalization entails regional unemployment and new forms of endemic poverty.

Environmental globalization – the starting point for the debate in this volume – causes the most serious threats. Some are caused by the “Tragedy of the Commons”. Garrett Hardin, in a famous essay written at the beginning of the environmental debate, used this phrase to warn against exploiting common property – grazing lands in the West, fish in the oceans, water in the river – without a keen eye on its sustainable yield and carrying capacity. Donella and Dennis Meadows, in *The Limits to Growth*, argued that population growth would outstrip the stocks of non-renewable resources, in particular fossil fuels. This particular prediction, following in the footsteps of Malthus and his concern about insufficient food for growing populations, was premature. New technologies, new discoveries and improved efficiency in using resources helped alleviate resource constraints. But the book was a milestone for focusing vigorous debate on linkages between natural, economic, and environmental factors.

In recent years, the very success of human industry has emerged as a direct threat to the functioning of natural systems – water, air, and land – that make possible human life on this planet. These new challenges fill the headlines of the papers and fuel heated debates: global warming, ozone depletion, loss of biodiversity, acid deposition, desertification, overpopulation, and resource intensive consumption. Many of these new issues are truly global in their reach, even though impacts may differ from place to place. They also require scientific research to identify and measure what is going on, making it difficult for many people to grasp

their importance and urgency. In each case, human activities, helped by ever more powerful technology and steadily increasing numbers of people, create conditions that may cause serious, perhaps irreversible harm to natural forces on which human life depends. The Global Change Research Act of 1990 offers this definition of the new challenge: “Changes in the global environment (including alterations in climate, land productivity, oceans or other water resources, atmospheric chemistry, and ecological systems) that may alter the capacity of the Earth to sustain life.”

The search for novel response strategies to address these global challenges is underway on a world-wide scale. It is still in its infancy. Most initiatives use *sustainable development* as their goal. The term means different things to different people, but a common foundation was laid by the Brundtland report (United Nations World Commission on Environment and Development, 1987). This report, after reviewing the new global challenges, suggested that they would dominate the international agenda of the twenty-first century. The report then proposed sustainable development as the appropriate response. Sustainable development, in this view, must seek three goals: economic and environmental priorities must be balanced, short-term and longer-term costs and benefits must be considered, and the stark differences in income and access to resources between rich and poor countries must be diminished.

This volume is published more than a decade into the debate on sustainable development. It seeks to highlight the many dimensions of sustainable development – not just economic and environmental, but also spiritual and religious, corporate and social, scientific and political. This introductory chapter establishes the link between global change and sustainable development. Sustainable development is a broad enough concept to respond to economic, social, as well as environmental challenges. It offers a new way to think about development in a world that is becoming more and more interdependent. Global change, in its many manifestations, is often referred to in the essays that follow, but this is not a book on climate change, population growth, poverty or any of the other specific driving forces of global change. Sustainable development acknowledges the seriousness of these problems and seeks solutions to these economic, environmental, and social issues. Global change and sustainable development are this generation’s challenge and response.

Two specific events stand behind this book. Four years ago, the National Academy of Sciences initiated the *Global Commons Project* – an analysis of

development issues during the next 50 years and the role science can play in identifying, monitoring and solving these challenges. As part of this effort, the Houston Advanced Research Center (HARC) examines the role of the private sector in sustainable development – one of the central themes in this book.

In 1997, the editors organized the DeLange/Woodlands Conference on Sustainable Development at the Rice University campus in Houston at which first results of the *Global Commons Project*, along with many other papers on sustainable development, were presented. The Academy released a major report of its findings in 1998 and convene a meeting of the world's academies of science in 2000. The Academy's approach in these activities is unique in that it focuses on the next 50 years. During these years a massive challenge needs to be met – to feed, house, and educate a world population with twice as many people as today. This stark reality defines what must be done in the lifetime of our children. The increase in population, with attendant increases in production and consumption, are already programmed. They cannot be undone. How compatible will these critical decades be with the principles of sustainable development? Will it be possible to defer to the end of this transition period the construction of human societies no longer dependent on constant economic growth? This transition to sustainability, and the agenda for action during this period, were at the heart of the DeLange ♦ Woodlands Conference.

This volume is made up of nine chapters that were commissioned following the Houston conference. Each author was asked to highlight and develop main conference themes. As a group the essays show that sustainable development, a decade into the debate, has become a powerful concept for thinking about the future – by no means a clear blueprint for action but a meaningful guidepost for leaders from business, society and policy.

To illustrate this point and summarize the main themes discussed in the book, we conclude with excerpts from the 1997 conference statement (HARC and Rice University, 1997). The report used the image of the road map to describe what lies ahead.

The destination

Most demographers project a rise in world population from the current 5.7 billion to between 8 and 12 billion by the middle of the next century. World population will then stabilize, and eventually decline. To manage the transition to sustainable development, we must find urgent answers to this question:

How can the economic and social systems of the world provide food, energy, jobs, education, and other amenities for this much larger population in ways that successfully balance economic and ecological needs?

The single most demanding challenge of sustainable development during this period will be to provide for the basic needs of this doubled world population. This will require continued rapid economic growth. By some estimates, the world economy will have to grow by a factor of eight. This growth estimate is based on a model that provides for meeting minimal needs for all people. We use this model because we agree that poverty and environmental degradation are two sides of the same coin.

We envision a sustainable world that is characterized by a balance between this level of economic growth and by ecosystem viability. Such a balance will enable us to mitigate the threat of global warming and other environmental problems. Achieving this balance depends on our acceptance of the limits to the absorptive capacity of the biosphere. We do not always know the boundaries of these limits, but we do agree that they exist.

The direction

Ethics and leadership

We agree that the examination of the role of ethics and leadership in shaping a sustainable society has been neglected. Yet, a successful transition will be realized only by a society that maintains respect for the natural environment. This value system represents the supporting pillars and principles that guide our actions through the transition. It dictates the manner in which we will respond to the challenge. It helps make possible the many detailed changes that are needed in technology and policy. Conversely, without ethical direction, managing the transition may well fail.

Sustainable development must not be allowed to become the domain of one ideology or political philosophy. The leaders that emerge through the transition are those that show the concrete appeal of sustainable development to widely diverse constituencies – developing countries as well as industrialized ones, industry as well as government, and loggers and fishermen as well as environmentalists. The concepts of ethics and leadership are difficult to define and analyze. It may seem implausible to consider changing an entire society's notions of these concepts and how they impact the transition. But these difficulties do not justify continued avoidance of discussing how ethics and leadership must play a role in the transition to sustainable development.

The scientific community and decision-making under uncertainty

Human actions are, among other factors, conditioned by our understanding of how the natural world works. Thus, science and technology play critical roles in informing decision-makers and citizens of the impacts of human activities on the behavior of the earth's ecosystems.

Public understanding of new discoveries by the scientific community is critical. Scientists must effectively communicate not just knowledge but also an understanding of and confidence in how that knowledge was acquired. Citizens for their part should not expect definitive answers in all cases, but they must be assured that scientific information is presented in good faith. Science can "tell us what will happen," "tell us the probability of its happening," and "tell us how we know." Citizens will choose how this information is used in the context of social, cultural, economic, and political knowledge or values.

At times, society does not know how to utilize scientific information in decision-making processes as it is often deemed incomplete and inconclusive. We sometimes have difficulty deciphering the signals we receive and hesitate to act decisively and effectively on this information. Accepting that our knowledge is limited and provisional, and that there may be limits to what we can know and predict, we must also accept the need to act on the current state of knowledge in our possession. We agree that we cannot always wait for science to reach its final understanding of complex issues. Rather we must utilize our social learning to move rapidly through the transition to sustainable development.

Market tools for managing the transition

We recognize the numerous obstacles, in the form of market failures and policy failures, that stand in our path to sustainability. Economists have long shown that the market system does not account for certain economic problems, such as externalities, free riders, and natural resource valuation. One area that deserves more attention is policy failures.

Policymakers, in their pursuit to create a particular industry or attempt to alleviate poverty, often develop policies that may not accomplish either objective, while resulting in significant environmental degradation. The evaluation of these "economic development" policies should be more rigorous, with special attention given to their environmental impacts.

We agree that the use of market tools should be the emphasis for an

efficient, successful transition to sustainability. The command-and-control policy paradigm that characterized the 1970s and 1980s in the developed countries should be revisited. When governments mandate processes and procedures the focus remains on compliance rather than innovation. Regulation should be instituted by goals instead of by compliance methods. This flexibility would allow corporations to determine the best technical solutions to mitigate their own environmental impacts, thus minimizing their cost of achieving sustainability.

Well-designed market tools for sustainability contain within them a better and more efficient means of providing the information that producers, consumers, and decision makers require in order to make sound judgments that will ensure the sustainable future of our planet. Performance standards such as the ISO 14000 may help provide this type of information. Tools such as full cost accounting and life-cycle analysis can further promote sustainable practices by bringing to the forefront the full range of environmental costs associated with the production, distribution, and consumption of a product or service. Cost shifting tendencies should be reduced and prices should reflect marginal social costs, thereby providing appropriate and correct signals to decision makers in the economic and political process.

Stakeholders and dispute resolution

Development over the last few decades has led to dramatic improvements in living conditions in many countries, while considerable social and economic dislocation has occurred in other places. Historically, the poor have been denied a voice in decisions that directly and indirectly affect their futures. Consequently, they may have also been denied an equitable share in the distribution of resources and gains from economic activity.

The social dimension of sustainable development requires that the most directly affected people take a leading position in development initiatives. Stakeholder participation in decision making establishes a sense of ownership of all interested parties in regard to a specific action, be it a program, a project, or a legal act. It provides for consensus building, and hence, political sustainability of decisions that affect the lives and interests of different people and entities.

We agree that dispute resolution among competing stakeholders, business, and government is critical to sustainability. It is in the best interest of the project developers to allow for stakeholder participation in the case of local development projects. Well-planned stakeholder involvement will only enhance the possibilities for the successful completion of a project or endeavor. Conflict is costly and inefficient.

Effective dispute resolution, however, requires that the playing field first be leveled through the empowerment of local populations. Empowerment is obtained through education on legal and economic rights and the management of stakeholder participation.

Bringing it together

As we journey on the road to sustainability, certain difficult technical questions must be resolved. For example, how much growth can we enjoy, and of what kind, before environmental harm becomes unacceptable? How can we reduce growth in population and consumption? How will the increased human presence affect other living creatures? How can we ensure well-being for a larger portion of the population under the new growth structures? To these concerns, we have, currently, no definitive answers, but we have shown our points of agreement. Given these limits, the critical challenge is: Can we move forward into action or will we be trapped in endless debate?

We do not advocate a full blown blueprint for change that will outline in detailed steps all that needs to be done to ensure a sustainable Earth. The process of discovering these individual steps cannot be coordinated into a well-packaged whole. It is inherently an incremental process and we learn step-by-step by doing.

We feel optimistic about the future. Human creativity thrives on challenge, and we are confident that solutions will be found. But it will require – beyond ethical changes, beyond voluntary measures, and beyond technical fixes – the creation of a shared vision of a sustainable and desirable world. With a common language on sustainability we can develop a broad understanding so that individual and interdisciplinary action is part of a synergistic and comprehensive approach to sustainability that leverages all sectors of society. We stress again the urgency in getting started on the road to sustainable development.

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National self-interest in the pursuit of sustainable development

There is no universally accepted definition of sustainable development,¹ nor do all definitions of sustainable development yield practical guidelines for policymakers. The concept is perhaps best defined as development that maximizes the long-term *net* benefits to humankind, taking into account the costs of environmental degradation.² Net benefits include not merely income gains and reduced unemployment and poverty, but also healthier living conditions and other benefits associated with improved environmental quality. Interpreted this way, sustainable development stresses not the need to limit economic growth, as some have argued (e.g., Daly 1991), but rather the need to grow and develop sensibly, to ensure that the benefits of development are long-lasting: that in the most general sense, people become better off over time.

Sustainable development represents an attempt to make conservation the handmaiden of development, while protecting the interests of future generations. Pragmatic concepts of sustainable development value environmental protection not for its own sake, but for its contribution to the welfare of present and future generations. A sustainable development strategy thus permits the providential depletion of natural resources and the intelligent utilization of the environment's waste assimilation services. One key condition for achieving sustainability is that natural resources and environmental services not be undervalued or underpriced – a condition that is frequently violated in practice, as we shall see.

International meetings have tended to emphasize a global perspective on sustainable development. Most notable in this regard is the 1992 “Earth Summit” (officially, the U.N. Conference on Environment and Development) in Rio de Janeiro. The global perspective is summarized in the catch phrase, “Think globally, act locally.” Interpreted literally, this

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