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IAP Statement on Transition to Sustainability

21 May 2000

During the 21st century, human society faces the daunting yet inspiring task of forging a new relationship with the natural world. This new relationship is captured by “sustainability,” a concept that has emerged from a number of international conferences concerned with regional and global trends in population, development, and the environment.* Sustainability implies meeting current human needs while preserving the environment and natural resources needed by future generations.

The Academies of Science of the world, as represented by the signatories to this Statement, offer here a collective set of observations about how the challenges can be addressed. In particular, we focus on what the scientific and technological community can do in the short and longer term, and what the Academies can contribute. In almost every instance, technical and analytical contributions of the scientific and technological community can be critical, but many facets of the problem require economic, social, and political efforts as well.

I. SCIENTIFIC ACHIEVEMENTS AND FUTURE CHALLENGES

The remarkable effects of science are evident everywhere. The 1999 Declaration on Science of the UNESCO-ICSU World Conference on Science

noted: “scientific knowledge has led to remarkable advances that have been of great benefit to humankind. Life expectancy has increased strikingly, and cures have been discovered for many diseases. Agricultural output has risen significantly in many parts of the world to meet growing population needs. Technological developments and the use of new energy sources have created the opportunity for freeing humankind from arduous labor. They have also enabled the generation of an expanding and complex range of industrial products and processes....” At the same time, it noted that “... applications of scientific advances have led to environmental degradation...contributed to social imbalance...and made possible sophisticated weapons.”

Even with the many positive achievements in using science for human benefit, the future challenges will be enormous and rapidly evolving. Hunger and poverty still exist in significant parts of the world. Global trends in climate change, environmental deterioration, and economic disparities are growing concerns. These multiple factors have mobilized us, the world’s scientific academies, to focus on how to promote the worldwide transition to sustainability more effectively.

The key issues that we see are:

1. Meeting the Needs of a Larger World Population: Reducing Hunger and Poverty and Preserving Human Well Being

During the next century, many more people will require food, housing, education, nurture, and employment. The world's human population has reached 6 billion and by 2050 is expected to reach nearly 9 billion. How much world population will grow will depend on choices made about family size and timing and the ability of new generations to implement these choices. About 80 percent of this population will live in areas now part of the developing world, and approximately two-thirds of them will be living in cities. The challenges of providing for the needs of these new urban and older populations are manifold and complex.

Nearly one billion persons are now impoverished or hungry with little or no employment. This number is likely to increase as world population grows. Worldwide disparities in incomes are also widening. Poverty and extreme inequity are incompatible with sustainability. The challenge is to reduce disparities by capacity building and to provide everyone with basic human requirements and with access to the knowledge and resources needed for a meaningful life.

Health challenges will include controlling infectious diseases and containing behavior-related health problems such as illegal drug use, tobacco, alcohol abuse, and obesity, which are already the causes of two-thirds of premature deaths worldwide.

2. Preserving and Maintaining the Environment and the Natural Resource Base

The earth's linked physical and biological systems--the atmosphere, oceans, soil, minerals, fresh water, and living organisms--keep the planet fit for life and able to provide for most human needs. The world's ecosystems and the species in them, in addition to their intrinsic value, provide many of the goods and services needed to sustain human life, including food, timber, forage, fuels, pharmaceuticals, and industrial precursors. They also recycle and purify water, mitigate floods, pollinate crops, and cleanse the atmosphere. Humanity now can change the environment on a global scale, as it has with the composition of Earth's atmosphere and may be doing with its climate. Achieving

a transition to sustainability will require safeguarding the welfare of biological species and their ecosystems in a rapidly developing world, even as we improve our still modest scientific understanding of these complex ecological processes.

3. Moving Toward Sustainable Human Consumption Patterns

Consumption involves the transformation of materials and energy. Such transformations can impact sustainability by either reducing future availability of materials and energy, or by damaging aspects of the environment important to human well being.

The forces that drive consumption are multiple and complex. They include economic output, the distribution of wealth and incomes, technological choices, social values, institutional structures, and public policies. Technological progress and innovation have in many countries and economic sectors made more efficient use of energy and materials. But still, global per capita economic activity and the use of energy have increased. As economies and affluence continue to grow, the challenge is to redouble efforts to increase efficiency, reduce damaging impacts, and move towards sustainable patterns of consumptive behavior.

II. WHAT CAN AND MUST BE DONE BY THE SCIENTIFIC AND TECHNOLOGICAL COMMUNITY

We see three main avenues for our efforts:

1. Achieve a Much More Equitable Access to and Use of Knowledge

•Improving Education

Education is an essential element of all aspects of a transition to sustainability. Yet the quality of education worldwide is inadequate. Continuation of global progress in the reduction of illiteracy is vital for the world of the 21st century. Even in relatively rich countries, the quality of education is quite uneven, and investment in education is in many cases inadequate. Science is often not taught in an exciting, effective way that gives students the ability to think analytically, with the tools and desire to continue their learning throughout their lives.

Education, particularly in natural and social sciences, is the basis for much productive and innovative economic activity. It is needed for successful adjustments to changing economic opportunities, and thus directly determinative of whether people have jobs and an improved quality of life.

Education of women is extremely important, including literacy in linguistic, scientific, technological, and legal areas. Women's education also contributes to the success of public health efforts, and to learning by the next generation. It is closely connected with choices concerning the size and timing of families, and therefore with the speed of the demographic transition.

There are critical roles for the scientific and technological community in education. The natural and social sciences must be present as an integral, core element. Literacy as a practical concept increasingly includes scientific and technical components. The scientific and technological community must be engaged as active partners with educational systems to assure inclusion of quality, exciting, and effective science education at all levels, and to provide a continued assessment of the effectiveness of learning from diverse educational experiences.

•Strengthening Worldwide Scientific and Technological Capacity

Use of scientific knowledge and best-available technologies will be essential elements of a transition to sustainability. They can contribute to new energy sources, more efficient methods of food production, better quality products, improved human health, options for institutional changes, and environmentally benign technologies. Science and technology also can provide the tools needed to gauge how well human needs are currently being met and the extent of progress toward sustainability.

A centerpiece of any strategy to achieve sustainability must be the accelerated development of local capacities in science, engineering, and health throughout the world. The ability of a society to benefit from the continuously expanding store of the world's scientific knowledge depends on human capacities. Citizens, the science and technological community, non-governmental

organizations, private enterprises, and local, regional and national governments must all contribute to definition of these needs, and to the ability to use and generate knowledge.

•Building a Global Information Network

Much knowledge, know-how, and capacity for improved decision making are now available throughout the world. However, there is a great need for mechanisms that can find and modify what one person, group, firm, or nation knows into something that another person, group, firm, or nation needs and can use. We now have remarkable new tools and opportunities for collaborations and partnerships, and for needs-based interactive efforts, rather than the unidirectional technical assistance of earlier programs.

New forms of communication technologies make possible a global electronic network that connects scientists, engineers, and health professionals to people in all countries and occupations. This network will allow people to access and assess the scientific and technical knowledge that they need to solve local problems and enhance the quality of their lives, as well as to communicate their own knowledge, insights, and needs to others. Scientists then must use these initial connections as a tool for spreading their knowledge, skills, and values throughout their own nations, including their local communities. By taking full advantage of new information technologies, while strengthening worldwide scientific capacity, the scientific community has an unprecedented opportunity to help close the vast "knowledge gap" among peoples.

•Expanding the Contribution of National Academies of Sciences, Engineering, and Medicine

Meeting the potential of science and technology to contribute to human welfare will require high standards of quality. This includes objective assessments of scientific knowledge and its uncertainties, pursuit of best practices, and development of a fuller understanding of the implications of technological directions. The academies, because of their merit-based peer selection process and independence, can help provide those standards of quality at all levels of the science and technology enterprise.

Many academies are now engaged in the organized provision of independent advice to their governments on policy matters that have important technical content. As more and more academies develop the capacity to provide such advice, they can increasingly be a force for wise decision making.

In many cases, effective decisions often must be reached and implemented by countries in cooperative ways. The academies are now engaged in working together, through the International Council for Science (ICSU) and the InterAcademy Panel (IAP), to build our individual and collective capabilities for understanding and meeting global challenges. We also intend to work in cooperation to provide common inputs to international agencies and other decision-making international bodies.

2. Actively Generate New Knowledge

The current store of knowledge, while it can and must be much more broadly applied, will not be adequate to meet projected and as-yet-unforeseen challenges to sustainability. The successful production and application of new knowledge is necessary. For example, global health challenges present severe challenges that require new fundamental understanding, as well as new tools arising from that understanding. Social sciences will have an increasing role to play in many areas, such as behavior-related health problems. Making a science of education, so that we much better understand the learning process and how to provide more successful teaching and learning throughout life, is also essential. Fundamental research in environmental and earth sciences, including ecology, biodiversity, climatology, seismology, and new interdisciplinary fields, will help our capability, now very limited, to predict or lessen the consequences of natural disasters and ecological change. Moreover, the global information network and its underlying technology can and certainly will rapidly evolve to provide new possibilities that we cannot now foresee.

More generally, the worldwide research enterprise must be significantly strengthened in four areas: sustaining long-term basic research and linking it to societal goals coupling global, national, and local institutions into effective

research systems linking academia, government, and the private sector in collaborative research partnerships integrating disciplinary knowledge into interdisciplinary, locally focused, problem-driven research and application efforts.

The worldwide scientific community also needs to develop indicators that inform society over the coming decades how and to what extent progress is being made in moving toward a transition to sustainability. Leading indicators should include: global assessments of human needs and environmental support systems regional measures of environmental vulnerability local evaluations of land use and ecosystems measures of progress in key areas such as health, water and air quality, and energy efficiency.

3. Apply the Values of the Scientific and Technological Community to Build Sustainability

Science is, in a very fundamental sense, the process of seeking the truth. The values of the scientific enterprise--openness, community, quality, and respect for evidence--are of great importance and application to the search for sustainability. The scientific community must be involved in the broad interactive process of establishing societal priorities, of understanding the implications of policy directions, and in fostering the public understanding and the political will to ensure that progress moves in directions that correspond to those priorities. That involvement is all the more important since we recognize that applications of science and engineering can sometimes produce harm rather than benefit.

During the past century, conflict--ranging from civil violence to world wars--has consumed or destroyed tremendous amounts of human, institutional, and physical resources. Military programs, even in periods of peace, have consumed resources that could otherwise be devoted to meeting such needs as food, housing, and education. During the decades ahead, conflicts could arise from competition for resources such as food, water, and information. A better understanding of how these events can be mitigated, or made less probable, is essential for a successful transition to sustainability. The natural and social sciences, engineering, and health communities can, together with the many other societal sectors, make

important contributions in building international understanding and cooperation, as well as in alleviating the root causes of conflict.

CONCLUSION

To preserve human well-being over the long term, people need to move toward new ways of meeting human needs, adopting consumption and production patterns that maintain the earth's life support systems and safeguard the resources needed by future generations. Yet if current trends in population growth, consumption of energy and materials, and environmental degradation persist, many human needs will not be met and the numbers of hungry and poor will increase.

Such a dismal forecast need not come to pass. Scientific, technological, and health capabilities-- if supported by the necessary worldwide political will and international cooperation, and mobilized by appropriate social and economic policies-- can produce substantial progress over the next two decades toward a sustainable human future. Realizing this progress will demand a threefold effort by the scientific and technological community: to promote the use of existing knowledge more widely and effectively, to generate new knowledge and beneficial technologies, and to work with governments, international organizations and the private sector to promote a worldwide transition to sustainability.

We, as Academies of Science, pledge our cooperation in these efforts.

Academy Signatories as of May 21, 2000:

African Academy of Sciences
Albanian Academy of Sciences
Argentina National Academy of Exact, Physical and Natural Sciences
Federation of Asian Scientific Academies and Societies
Australian Academy of Science
Austrian Academy of Sciences
Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique
National Academy of Sciences of Bolivia
Academy of Sciences and Arts of Bosnia and Herzegovina
Brazilian Academy of Sciences
The Royal Society of Canada
Caribbean Academy of Sciences

Chinese Academy of Sciences
Colombian Academy of Exact, Physical, and Natural Sciences
Croatian Academy of Sciences
Cuban Academy of Sciences
Academy of Sciences of the Czech Republic
Royal Danish Academy of Sciences and Letters
Estonian Academy of Sciences
Finnish Academy of Arts and Sciences
French Academy of Sciences
Union of German Academies of Sciences and Humanities
Academy of Athens
Hungarian Academy of Sciences
Indian National Science Academy
Indonesian Academy of Science
Islamic Republic of Iran Academy of Sciences
Royal Irish Academy
Israel Academy of Sciences and Humanities
Accademia Nazionale dei Lincei
Science Council of Japan
Royal Scientific Society of Jordan
Academy of Sciences of the Democratic Peoples Republic of Korea
National Academy of Sciences of the Republic of Korea
Latin American Academy of Sciences
Latvian Academy of Sciences
Lithuanian Academy of Sciences
Macedonian Academy of Sciences and Arts
Academy of Sciences of Malaysia
Royal Nepal Academy of Science and Technology
Royal Netherlands Academy of Arts and Sciences
Royal Society of New Zealand
Nigerian Academy of Sciences
Polish Academy of Sciences
Romanian Academy
Singapore Academy of Sciences
Slovak Academy of Sciences
Slovenian Academy of Sciences
Academy of Sciences of South Africa
Royal Academy of Exact, Physical, and Natural Sciences of Spain
National Academy of Sciences of Sri Lanka
Royal Swedish Academy of Sciences
Conference of the Swiss Scientific Academies
Thai Academy of Science and Technology
Third World Academy of Sciences
Turkish Academy of Sciences
National Academy of Sciences of Ukraine
The Royal Society of London
National Academy of Sciences of the United States of America
Pontifical Academy of Sciences
National Academy of Physical, Mathematical, and Natural Sciences of Venezuela

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