

Recommendations for

# EDUCATION FOR A SUSTAINABLE AND SECURE FUTURE



A REPORT OF THE THIRD NATIONAL  
CONFERENCE ON SCIENCE, POLICY  
AND THE ENVIRONMENT

JANUARY 30-31, 2003  
WASHINGTON, DC



National Council for Science and the Environment  
*Improving the scientific basis for environmental decisionmaking*

**THE NATIONAL COUNCIL FOR SCIENCE AND THE ENVIRONMENT (NCSE)** has been working since 1990 to improve the scientific basis of environmental decisionmaking and has earned an impressive reputation for objectivity, responsibility, and achievement.

The Council envisions a society where environmental decisions are based on an accurate understanding of the underlying science, its meaning, and its limitations. In such a society, citizens and decisionmakers receive accurate, understandable, and integrated science-based information. They understand the risks, uncertainties, and potential consequences of their action or inaction.

Supported by over 500 academic, scientific, environmental, and business organizations, and federal, state, and local government, NCSE works closely with the many communities creating and using environmental knowledge to make and shape environmental decisions.

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- **Developing Science Solutions for Environmental Challenges.** The Council brings stakeholders together through its Center for Science Solutions to develop and implement science-based solutions to specific environmental problems. The first program under the Center, the National Commission on Science for Sustainable Forestry, endeavors to develop a better scientific foundation for assessing and improving sustainable forest management practices.

# Recommendations for EDUCATION FOR A SUSTAINABLE and secure FUTURE

“THIS CONFERENCE IS AT THE INTERSECTION OF THE TWO MAIN THRUSTS OF THE ACADEMY: EDUCATION—SPECIFICALLY SCIENCE AND MATH EDUCATION—AND SECONDLY, WHAT WE CALL ‘SUSTAINABILITY SCIENCE.’” BRUCE ALBERTS, PRESIDENT, NATIONAL ACADEMY OF SCIENCES

This report contains recommendations for sustainability education to be applied throughout the United States and to shape the upcoming United Nations Decade of Education for Sustainable Development (2005-2015).

## ONLINE RESOURCES

NCSE's Education for Sustainability (EFS) website serves as a meeting point for online discussions and educational resources related to education for a sustainable and secure future. Readers are encouraged to register their thoughts about recommendations published in this report on the online bulletin boards for each conference breakout session. The site includes links to sustainability education resources, transcripts of key presentations, order forms for video and audio tapes of plenary lectures and roundtable discussions, and more.

To access NCSE's Education for Sustainability resources, visit the website at: <http://www.NCSEonline.org/EFS>

For additional information, e-mail [Conference@NCSEonline.org](mailto:Conference@NCSEonline.org).

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**For citation purposes, please use:**

National Council for Science and the Environment (NCSE). 2003. *Recommendations for Education for a Sustainable and Secure Future*. David E. Blockstein and Julie Greene, Eds. Washington, DC.

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# EXECUTIVE SUMMARY

This report summarizes the events and deliberations that occurred during the conference and the resulting recommendations to expand and improve education for sustainability and security.

**THE NATIONAL COUNCIL FOR SCIENCE AND THE ENVIRONMENT** (NCSE) held its third National Conference on Science, Policy and the Environment, *Education for a Sustainable and Secure Future*, on January 30-31, 2003 in Washington, DC. The conference provided a meeting ground for more than 800 scientists, educators, managers and policymakers from the United States and other nations to collectively consider the role of education in providing a sustainable and secure future. The conference brought leaders in society and science together representing the many aspects of the educational enterprise, from formal (K-12, college, and graduate) to informal, including public educators and experts in environmental, sustainability, nature, agricultural, science, and engineering education. Nearly every discipline and perspective in the broad environmental enterprise was represented. The National Council for Science and the Environment (NCSE) thanks their cosponsors and all who took part in the conference. A list of participants is available on page 78.

**BACKGROUND ON EDUCATION FOR SUSTAINABILITY (CHAPTER 1).** Human and global security, economic opportunity, and the quality of life of humans and other species depends upon the continued availability of a life-sustaining environment. Education is essential to allow people to make informed and wise choices. Formal and non-formal educational institutions are uniquely positioned to help solve the challenges of environmental, social, and economic sustainability through innovations in teaching.

The current era of environmental awareness began with the publication of Rachel Carson's alarm call *Silent Spring* in 1962. It was followed by the creation of environmental

studies and environmental science programs in many of the nation's campuses. Earth Day, beginning in 1970, educated the public about the deteriorating condition of the planet's life support systems. The growing awareness of the environment and the need for changing the relationship between humanity and the planet led to three multinational global scale conferences: the 1972 United Nations Conference on the Human Environment (Stockholm Conference), the 1992 UN Conference on Environment and Development (Earth Summit), and the 2002 World Summit on Sustainable Development (WSSD). Each of these conferences and many meetings and declarations in between highlighted the importance of education. Aside from the word "government," "education" appears more often than any other term in the Earth Summit's comprehensive plan for global sustainability, *Agenda 21*. The WSSD spawned the upcoming United Nations Decade of Education for Sustainable Development (2005-2015).

## **RECOMMENDATIONS FOR EDUCATION FOR A SUSTAINABLE AND SECURE FUTURE (CHAPTER 2).**

Building upon this foundation, participants in the third National Conference on Science, Policy and the Environment convened in twenty-one breakout sessions to develop recommendations for advancing environmental and sustainability education. The sessions covered nearly the full range of life-long learning, including formal education in elementary and secondary schools, college and professional schools, as well as business and community education, public education and linking education and practice. Topics addressed included health, diversity, research, conservation education and how to move from education for sustainability into sustainable practices.

The recommendations collectively form an educational agenda for the United States and are intended to shape the UN Decade of Education for Sustainable Development. They revolve around the central tenet that a new approach to education is essential to simultaneously protect the environment and provide for economic and personal well-being, which together form the foundation for human and global security.

Conferees emphasized that sustainability concepts must be infused across the full range of life-long learning, including formal education in elementary and secondary schools, colleges, and professional schools, as well as community and public education. Messages that connect sustainability to personal core values need to be developed. Educators and the mass media are needed to communicate these messages to students and the public. Inclusiveness and diversity are essential in all aspects of education.

Sustainability should not be viewed as a separate field of study, but rather as an interdisciplinary approach to understanding that is integrated across the curriculum at all levels. Learning is best achieved through experiential, inquiry-based, and team-building approaches that utilize critical thinking and problem-solving skills and emphasize systems and human-nature interactions. It is important to understand geospatial and temporal frames of reference. Context is as important as content.

Many educators and educational organizations are not yet prepared to implement education for sustainability. Support is necessary for the continuum of professional development, from educators to practitioners in sustainability and environmental education. Curricula need to be developed, including content, tools, and materials such as real-world case studies and examples of best practices. Baseline information about the status of sustainability education and practice in the United States is largely absent. Criteria to measure success must be developed and implemented.

Education regarding sustainability concepts must be linked to their use in business and in peoples' daily lives. The gap between education and practice is often wide. Schools, businesses, agencies and other organizations must become leaders in "practicing what we teach" through adopting sustainable practices (activities, culture, personal relationships and community involvement) and creating sustainable facilities, for example, making every school a solar school, balancing their carbon budget and minimizing their ecological footprint on the planet. There is great potential to integrate practice into education—learning by doing.

Despite good intentions, there are many barriers to education for sustainability, ranging from narrow thinking to narrow budgets. Funding and incentives such as changes in accreditation systems are necessary for any of the above to succeed.

### CONFERENCE SPEECHES, AWARDS, AND ACTIVITIES (CHAPTER 3).

Jonathan Lash, President of the World Resources Institute, presented the keynote address, making the case for a broad definition of human security that depends upon fighting poverty, protecting the environment, and protecting people's rights as the path to global security. In his plenary address, Ray Anderson, Chairman of Interface Flooring Systems, Inc., challenged educators and the education system to dispel ecological and social ignorance and help define the path society should choose to ensure the survival of *Homo sapiens* and all life on earth.

National Science Foundation Director Rita Colwell presented the third John H. Chafee Memorial Lecture on Science and the Environment. She described a new age of scientific exploration that holds great potential for transforming our understanding of environmental processes and providing new tools to address environmental problems. She identified the integration of environmental research and education at all levels, and collaboration across diverse communities as vital to designing sophisticated and effective solutions that will move humanity toward an environmentally sound future. Dr. Colwell's address will be published in a separate report produced by the National Council for Science and the Environment and is available in an archived webcast on the conference website, <http://www.NCSEonline.org/EFS>.

Earth Day Founder and former U.S. Senator Gaylord Nelson received the NCSE Lifetime Achievement Award. He spoke of the progress in public understanding of environmental issues due to the expansion of environmental education over the last 30 years. Educators, scientists, and leaders from government and civil society participated in lively roundtable discussions on the relationship between sustainability and security; sustainability education; and public communication of sustainability concepts. Audio and videotapes of these roundtables and the plenary lectures are available from the National Council for Science and the Environment.

**IMPLEMENTATION OF RECOMMENDATIONS.** The National Council for Science and the Environment is committed to advancing education for a sustainable and secure future. We have formed an implementation committee to bring these recommendations into reality. To help, contact Dr. David Blockstein at 202-207-0004 or [David@NCSEonline.org](mailto:David@NCSEonline.org).



# COMMENTS FROM CONRAD C. LAUTENBACHER, JR.

Administrator, National Oceanic Atmospheric Administration (NOAA)



UNITED STATES DEPARTMENT OF COMMERCE  
The Under Secretary of Commerce  
for Oceans and Atmosphere  
Washington, D.C. 20230

MAY 16 2003

The forces of social change and global development present a number of serious issues for the world's leaders, decision-makers, and international institutions. I strongly believe we have reached a time where human ingenuity must be applied to developing a deeper understanding of the complex systems of Planet Earth. The 3<sup>rd</sup> National Conference on Science, Policy and the Environment, and its central theme: "Education for a Sustainable and Secure Future" points to a mission that the engineers of public policy must continue to recognize as essential. I strongly believe that the promotion of education, research, and use of critical technologies have a positive effect on communities across the globe. This conference, and the important recommendations in its report, are tools for building the kind of strong, healthy, and secure society we all desire.

The National Oceanic and Atmospheric Administration (NOAA) is proud to have been a sponsor of this conference. We recognize that as society becomes increasingly technology dependent, our reliance on full use of our human talent becomes even more essential. Therefore, developing a science and technology literate people from our diverse population is essential for our collective future. NOAA has recently created an Office of Education and Sustainable Development to coordinate and direct education activities undertaken by the agency. One goal is to increase the diversity of our own workforce, as well as inspiring a new generation of minority children nationwide, to make science a lifelong interest. This action will help to implement one of the primary recommendations to come out of the conference, namely, the need for guidelines and resources to assist educators and public communicators to understand and teach about the linkages between environmental sustainability and security. NOAA's Educational Partnership Program with Minority Serving Institutions is working to expand opportunities for minorities to pursue education and careers in the environmental science field.

NOAA is proud to have been a sponsor of this conference and commits itself to working in partnership with others to achieve our shared vision of an environmentally sustainable and secure future for humankind.

Sincerely,

A handwritten signature in blue ink that reads "C. Lautenbacher, Jr." with a stylized flourish at the end.

Conrad C. Lautenbacher, Jr.  
Vice Admiral, U.S. Navy (Ret.)  
Under Secretary of Commerce for  
Oceans and Atmosphere



# COMMENTS FROM PAUL GILMAN, PH.D.

Assistant Administrator for Research and Development, U.S. Environmental Protection Agency (EPA)



## RESEARCH PAVES PATHS TO SUSTAINABILITY

The Environmental Protection Agency works at accomplishing its dual mission—of *protecting human health, and safeguarding the natural environment*—in a variety of ways. For example, the Agency’s Office of Research and Development, in helping to realize that mission focuses on generating and reporting on reliable scientific and technical information that can inform management actions and decisions. Those are actions and decisions to be made at levels that are international, national, regional, State, local—or even personal. This kind of work, and the outcomes that spring from it, speak directly to this Conference’s vision of building knowledge to arrive at an increasingly comprehensive balance among people, their decisions, their activities and their environment.

A significant consideration in making sure that our work is relevant revolves around our ability to assure that our scientific products are accessible, understandable and useful to people. That is because it is likely that without these important attributes, the scientific and technical information and data we generate will not blossom into knowledge—and possibly more important, wisdom. Just creating information is not enough.

Of the Overarching Themes of this Third National Conference on Science, Policy and the Environment, with its decided focus on *education*, I believe that the need for people to grasp geospatial and temporal frames of reference represents a beacon. The notions embodied in this ‘*spatio-temporal*’ theme provide the guiding and orienting signals of place, context and continuity to acquired information, helping us mold that information into understanding.

The Agency and ORD have a longstanding commitment to linking the information and data they collect with spatial and temporal metadata. I will venture to say, however, that few people realize that we place a strong emphasis on the ‘*spatio-temporal*’ aspects of the human dimensions of environmental protection. That is, we recognize and try to account for a ‘*sense-of-place*’<sup>1</sup> in planning, conducting, interpreting and reporting our research. This means that we try to understand and account for such things as social, cultural, behavioural, and aesthetic drivers in paving the way for sustainable outcomes to our activities.

This leads me directly to what I feel is a thread that is woven throughout the Primary Recommendations developed by Breakout Session participants at the Conference. That pervasive thread is communication (preferably of the two-way variety). The ORD is an information generator (and ideally an effective information collector and disseminator) that cannot consider its work complete until—as mentioned above—that information becomes understanding and knowledge. We recognize that we have a spectacular spectrum of audiences—groups with specific interests in the conduct, quality, significance, and benefits or consequences of our research<sup>2</sup>. Getting needed information to these groups, with requisite levels of transparency, reliability, consistency and credibility is a task that accompanies doing defensible science. We believe strongly in proactive customer involvement and have adopted principles that include effective, inclusive science planning or “Doing the right science” that leads to “Doing the science right.” For both of these principles, stakeholder involvement and awareness are enabling elements.

The two points that I have addressed, the ‘*spatio-temporal*’ theme and the necessary tool of effective communication, likely will be key factors in the ability of science and technology to drive knowledge and understanding that can be used to identify, measure and maintain achievement within the varied domains of sustainability.

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<sup>1</sup>U.S. Environmental Protection Agency. 2002. *Community Culture and the Environment: A Guide to Understanding a Sense of Place*. Report No. EPA 842-B-01-003. Office of Water. Washington, DC.

<sup>2</sup>U.S. Environmental Protection Agency. 1996. *Principles for Effective Communication with Communities About Ecological Issues*. Report No. EPA 236-F-96-001. Office of Policy, Planning and Evaluation. Washington, DC.

# CHAPTER 1: BACKGROUND ON EDUCATION FOR SUSTAINABILITY

CONTEXT OF EDUCATION FOR SUSTAINABILITY  
HISTORY OF INTERNATIONAL EVENTS AND DECLARATIONS  
ADVANCING EDUCATION FOR SUSTAINABILITY

Chapter one material is modified from Calder, W. and R. Clugston. 2002. Higher Education.  
In J. C. Dernbach, Ed. *Stumbling Toward Sustainability*. Washington, DC: Environmental Law Institute.  
Additional material provided by R. W. Flint.

# CONTEXT OF EDUCATION FOR SUSTAINABILITY

One of the central challenges of the 21st century is how to achieve a more sustainable relationship between people and the environment. The security of people and nations, economic opportunity, and quality of human life depend upon the continued availability of a life-sustaining environment. Education is essential to enable people to make informed choices about their local and global environmental conditions.

**EDUCATION IS A BROAD**, diverse, complex, and life-long enterprise, including formal and informal learning for youths and adults. In addition to formal elementary, secondary, and college education, libraries, museums, aquariums, zoos and nature centers, corporations, youth-serving and other nongovernmental organizations (such as 4-H, scouting, and conservation organizations), the media, and all levels of government are components of the educational enterprise. Each has a role in offering a vision of a better future and the means to achieve it.

## WHY DOES EDUCATION MATTER?

Ecological disorder reflects a prior disordering of thought, perceptions and values. The ecological crisis is a crisis of mind, which makes it a challenge for those institutions which purport to improve minds. It is, in other words, an educational crisis.<sup>1</sup>

Why is it important for educators in the United States—and indeed elsewhere—to commit to ensuring a sustainable and secure future?

First, as most of the literature in this field points out, it is important from a moral perspective. Because our schools and universities educate our citizens and train our future teachers, policymakers, and community and business leaders, these institutions bear a deep and moral responsibility to provide the expertise and vision needed to foster a sustainable future. Furthermore, academic freedom, tax-free status and public resources are granted to American educational institutions in exchange for the dissemination of knowledge and values to ensure the health and well-being of society.<sup>2</sup>

Second, our educational institutions should pursue this course from a practical perspective: they are uniquely equipped to help solve the challenge of sustainability through innovation in teaching and learning. Sustainability is more than a framework for categorizing environmental, social and economic challenges; it is also a way of thinking about these issues. If education does not promote thinking from a systems perspective and foster creativity, humanity will continue to make little progress at reducing global environmental degradation and poverty. Education for sustainability (EFS) calls for integrated decisionmaking based on integrated information to enable individuals, organizations, institutions, businesses, and governments to incorporate environmental considerations and goals into social, economic—and even security—decisions. Part of the intellectual challenge of sustainable development, therefore, is that it involves learning how to solve complex multidimensional problems. Education can give students and future leaders the intellectual tools for doing that.

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<sup>1</sup>Orr, D. 1994. *Earth in Mind*. Island Press.

<sup>2</sup>Second Nature and University Leaders for a Sustainable Future. 1995. *Workshop on the Principles of Sustainability in Higher Education: Essex Report*. See also Cortese, A.D. 1999. *Education for Sustainability: The University as a Model of Sustainability*; and Cortese, A.D. 1999. *Education for Sustainability: the Need for a New Human Perspective*. Available at <http://www.NCSEonline.org/EFS/SecondNature>.

Third, a U.S. commitment to the research and teaching of sustainability matters because the U.S. educational enterprise influences the standards and practices of education throughout the world. American colleges and universities serve more international students than those of any other country. It is imperative that American education contribute to solving the global challenge of sustainable development.

### WHAT DOES SUSTAINABILITY IN EDUCATION MEAN?

Strong local communities that sincerely acknowledge the foundational importance of education to their longevity and vitality are the best environments for excellence in education. To be most effective and relevant, education cannot isolate learners from the context of the larger world in which they must ultimately function. Sustainability can be used as an integrating force in education to improve and facilitate academic and community relationships. If sustainability and its foundation in scientific, environmental, technological, economic, societal, and ethical learning is to become a paradigm for analysis, decisionmaking, planning, and action, it is essential that it be incorporated into the curriculum and instructional practices at all levels of schooling, which in turn can strongly influence programs for community education.

According to the Annenberg Rural Challenge<sup>3</sup>, newly-trained graduates should possess:

- the knowledge to comprehend linkages among all living things, and their dependency on each other as well as the physical environment;
- the understanding for basic principles that govern natural systems and the ability to apply this knowledge to the limits to, and major factors associated with, Earth's capacity to sustain life;
- the ability to cross the boundaries of very diverse disciplines, including the understanding for cultural, economic, and political forces both past and present that affect attitudes and decisionmaking about natural environments based upon science and technology understanding;
- the skills to better understand connections between science/technology and the natural/cultural environments;
- the talent for seeing “the big picture” in employing scientific method and technology as organizing tools to enhance a community's capacity for using local assets to build sustainable communities;

- the competence to think at a level where one can integrate scientific knowledge, economic and political realities, historical and cultural experiences, and moral, philosophical, and aesthetic values;
- the skills to engage in scientifically, socially, and culturally informed dialogue on environmental issues in communities in which the professional works and lives;
- the respect for the “public way of knowing” as well as the “expert way of knowing”; and
- the understanding for how people organize as family, community, etc., and how activities used to meet needs affect societal health, environment, and quality of life for present and future generations.

### BUILDING UPON THE FOUNDATION OF ENVIRONMENTAL EDUCATION

“The student who can begin early in life to think of things as connected, even if he revises his view with every succeeding year, has begun the life of learning.”<sup>4</sup> Although written 60 years ago, these words are still relevant in today's world. Environmental education has more than a quarter-century history as an identifiable field. Yet, there is consistently a lack of crossdisciplinary research, information dissemination, and policy development that takes into account the connected challenges of environmental management and public decisionmaking today. In fact, a lack of recognition of the extent to which all things are connected and a poor understanding of basic principles that govern natural systems has been partially responsible for adverse environmental impacts, economic failures, social programs that do not work, and difficulties in achieving sustainable societies.

Science programs prepare students to carry out professions in what is considered “basic” research and teaching. Although some of these programs have formed the basis of present consciousness and understanding of environmental and sustainability issues among the American populace, the awareness and knowledge that will carry us to a sustainable and secure future cannot come only from the sciences. Social, economic, cultural, political, and moral components are equally important because of the multi-faceted nature

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<sup>3</sup>As reported in Flint, R.W., McCarter, W., and T. Bonniwell. 2000. Interdisciplinary Education in Sustainability: Links in Secondary and Higher Education. *The International Journal of Sustainability in Higher Education*, vol 1(2). Pp 191-202.

<sup>4</sup>Quote by Mark Van Doren, 1943, as reported in Orr, D.W. 1992. *Ecological Literacy: Education and the Transition to a Post-Modern World*. State University of New York Press.

of most issues facing society. As more of society becomes aware of sustainability and its philosophical foundation, new dimensions are necessary in education. Consider the great shifts over recent years in public attitudes about diet, exercise, fitness, preventive health, and wellness; or about pollution, global warming, and stratospheric ozone depletion. These changes are the result of public education based on new scientific understanding. Tough issues remain, however, that are going to require a new way of preparing the public at large as well as professionals and decisionmakers who have to deal with complex, interconnected issues and the values that underlay many of these concerns.

Schools and the instruction they provide are often highly compartmentalized. But current students live and will work in a world where information from many disciplines must be integrated. For these reasons a recent National Science Foundation-sponsored workshop entitled “Nature and Society”<sup>5</sup> recommended that up to 20 percent of teaching and research budgets be devoted to broad interdisciplinary student learning. This allocation emphasizes both the importance of interdisciplinary training as well as the need to maintain the disciplinary foundations upon which such training is built.

Education strategies are being considered now that prepare a new professional to feel comfortable in a multidisciplinary framework. Individuals cannot have all the specialized knowledge relevant to decisions they make in their private, work, or civic life. They must realize through the education process, however, that such information is relevant and available. Even if they are not experts in everything, they can appreciate the work of others, and they can collaborate with others to achieve integrated solutions. Such an approach would enable graduates to apply their learning to the needs of real world problems and real people. Crossdisciplinary education enlarges students’ awareness of issues and methods beyond their own

disciplinary inquiry, enabling them to explore the relationships among these issues and encouraging students to view their studies from a broader social and ecological perspective that takes into account human values and environmental, social, and economic sustainability.

Curricula can be “packaged” to emphasize the connectivity among scientific, social, economic, technological, cultural, and value-based experiences, demonstrating the relationship between high quality environments and the other aspects of people’s lives. Adding these components to traditional environmental education, students can become much more aware of and sensitive to the obstacles to a sustainable future for our global society by grounding the “stuff” of science education in real life and real problems. There is an urgency for innovative interdisciplinary education approaches that “mimic” life in the community and the natural environment so that the boundaries between education and community existence become less defined and therefore, more integrated.

It has been said that “the Earth is not something we inherit from our parents, but rather something we have on loan from our children.” By providing students at all levels of the educational spectrum with the tools necessary to participate as active members of their communities, having the creative, problem-solving skills, social literacy, and commitment to engage in responsible individual and cooperative actions that will lead to ecologically viable, socially just, and economically secure societies for present and future generations, we involve them in caring for the environment as citizens and perhaps one day as professionals, trained to protect and restore their birthright and their legacy.

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<sup>5</sup>Kinzig, A., et al. 2000. *Nature and Society: An Imperative for Integrated Environmental Research*. A report of the National Science Foundation-sponsored workshop, Nature and Society, held June 2000.

# HISTORY OF INTERNATIONAL EVENTS AND DECLARATIONS ADVANCING EDUCATION FOR SUSTAINABILITY

**FOLLOWING THE INCREASED AWARENESS** in the 1960s of the deteriorating condition of the Earth's life support systems, the United Nations Conference on the Human Environment (held in Stockholm in 1972) initiated a growing international interest in the role of education in fostering a sustainable future. Agenda 21, the extensive blueprint for building a sustainable world that came out of the Earth Summit (UN Conference on Environment and Development) in 1992, made this agenda explicit. International conferences in the 1990s and official declarations, especially for higher education, helped to clarify the meaning of education for sustainability (EFS) and fostered numerous examples, in the U.S. and abroad, of commitment to sustainability in the teaching, research, outreach and operations of schools and universities. New declarations and international partnerships for education emerged at the 2002 World Summit on Sustainable Development. The Summit recommended that the United Nations General Assembly declare a Decade of Education for Sustainable Development to begin in 2005, a decision that would help bring renewed global attention to the issue. The General Assembly approved the Decade in October 2002.

Principle 19 of the Stockholm Declaration (1972) calls for environmental education from grade school through adulthood to "broaden the basis for enlightened opinions and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension."<sup>6</sup> In 1977, the Intergovernmental Conference on Environmental Education in Tbilisi produced the first international declaration on environmental education.<sup>7</sup> The Tbilisi Declaration promoted

environmental teaching, research, and training, and their importance for economic development, as well as technical and vocational education. It also recognized the essential interdisciplinary nature of environmental education:

Environmental education...is necessary for students in all fields, not only natural and technical sciences, but also social sciences and arts, because the relationship between nature, technology and society mark and determine the development of a society.<sup>8</sup>

After some stagnation during the 1980s, a growing awareness of environmental problems such as climate change and biodiversity loss, the report of the World Commission on Environment and Development (also known as the Brundtland Commission because it was chaired by Gro Harlem Brundtland, then Prime Minister of Norway)<sup>9</sup>, and preparations for the Earth Summit, gave new international attention to the environment and the issue of education for sustainability in the early 1990s.

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<sup>6</sup>*Declaration of the United Nations Conference on the Human Environment*, June 16, 1972.

<sup>7</sup>Sponsored by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations Environment Program (UNEP), this conference marked the beginning of environmental education initiatives on an international governmental level.

<sup>8</sup>UNESCO-UNEP. 1977. *Tbilisi Declaration*.

<sup>9</sup>The most frequently cited definition of sustainability came from the report of the World Commission on Environment and Development (WCED), chaired by Gro Harlem Brundtland, then prime minister of Norway. Sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.

The term “education for sustainability” (or “education for sustainable development”) emerged primarily out of the Earth Summit. For many educators, it is defined more broadly than “environmental education” to include issues of international development, economic development, cultural diversity, social and environmental equity, and human health and well-being.

Aside from the word “government,” “education” appears more often than any other term in the Earth Summit’s comprehensive plan for global sustainability—*Agenda 21*. Education underlies and has the potential to reinforce every other priority in this comprehensive document. Chapter 36 of *Agenda 21*, on “Education, Public Awareness and Training” states, “education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues.” It touches on most of the major priorities of EFS today: cross-disciplinary curriculum development; scientific and community-based research; and outreach and multi-stakeholder network formation to promote environmental awareness and sustainability. *Agenda 21* identifies education as critical for “motivating and involving people in building a sustainable future.”

Since 1996, the United Nations Commission on Sustainable Development<sup>10</sup> and the United Nations Educational, Scientific and Cultural Organization (UNESCO), which is responsible for implementation of Chapter 36, have promoted EFS in various official documents and conferences. In 1995, the U.S. President’s Council on Sustainable Development produced an ambitious report entitled *Education for Sustainability: An Agenda for Action*, which presents a series of initiatives and recommendations for all education based on the core themes of lifelong learning within formal and nonformal educational settings; interdisciplinary approaches; systems thinking; partnerships between educational institutions and the broader community; and multicultural perspectives. This document, the result of extensive research and collaboration among hundreds of representatives from the education, business, governmental and non-profit sectors, certainly did not change the face of education in America. Yet it remains a significant federally-sponsored document on the actions and policies needed to educate American citizens regarding sustainability.

On September 4, 2002, after a protracted and difficult drafting process, the World Summit on Sustainable Development (WSSD) released its *Political Declaration and Plan of Implementation*. Education for sustainable development (ESD) and the crucial role of education (and educators as a stakeholder group) in assisting in the transition to a sustainable future were not major themes in these documents. However, the WSSD provided opportunities for stakeholders committed to education to clarify goals and further develop plans of implementation. A large Japanese delegation strongly supported the cause of education and proposed a UN Decade of Education for Sustainable Development. Nearly 300 official “Type II Partnerships,” involving governmental agencies, non-governmental organizations, and corporations, were announced. Many of these are directly or indirectly committed to enhancing education for sustainable development.

The UN Decade of Education for Sustainable Development, to begin in 2005, presents another opportunity for educators at all levels and in all disciplines to consider the fundamental role of their work in building a sustainable future. The Decade will promote the exchange of visions from different cultures, making conservation of cultural diversity a key element of sustainable development.<sup>11</sup>

Education is essential to human progress. Without a more intense and active engagement of the education community, combined with the serious commitment of funding institutions, it will be difficult for humanity to solve the complex global challenges that we face.

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<sup>10</sup>The CSD was created in December 1992, to ensure effective follow-up of UNCED and to monitor and report on implementation of the Earth Summit agreements at the local, national, regional and international levels.

<sup>11</sup>Posey, D.A., Ed. 2000. *Cultural and spiritual values of biodiversity: A complementary contribution to the global biodiversity assessment*. Published by ITP on behalf of UNEP. This volume calls the attention of the global community to the threatened extinctions of visions from cultures that have maintained a more harmonious relationship with their environment. These visions may enrich education approaches to sustainable development.



## CHRONOLOGY OF EVENTS AND DECLARATIONS RELATED TO EDUCATION FOR SUSTAINABILITY

YEAR	EVENT / DECLARATION
1962	Publication of <i>Silent Spring</i> by ecologist Rachel Carson helps launch the modern environmental movement
1970	Earth Day founded by Senator Gaylord Nelson
1972	<i>Stockholm Declaration on the Human Environment</i> , United Nations Conference on the Human Environment, Stockholm <a href="http://www.unep.org/Documents/Default.asp?DocumentID=97">www.unep.org/Documents/Default.asp?DocumentID=97</a>
1972	<i>The Limits to Growth</i> by Dennis Meadows et al. published by the Club of Rome
1975	<i>The Belgrade Charter</i> , Belgrade Conference on Environmental Education <a href="http://eelink.net/FCCSET/EndNotes.html">http://eelink.net/FCCSET/EndNotes.html</a>
1977	<i>Tbilisi Declaration</i> , Intergovernmental Conference on Environmental Education <a href="http://www.gdrc.org/uem/ee/tbilisi.html">www.gdrc.org/uem/ee/tbilisi.html</a>
1980	First National Global Education Conference, the American Forum for Global Education and the U.S. Department of Education <a href="http://www.globaled.org">http://www.globaled.org</a>
1983	<i>A Nation at Risk: The Imperative for Educational Reform</i> , The National Commission on Excellence in Education. <a href="http://www.ed.gov/pubs/NatAtRisk/">http://www.ed.gov/pubs/NatAtRisk/</a>
1987	<i>The Brundtland Report, Our Common Future</i> , World Commission on Environment and Development. <a href="http://www.doc.mmu.ac.uk/aric/eae/Sustainability/Older/Brundtland_Report.html">http://www.doc.mmu.ac.uk/aric/eae/Sustainability/Older/Brundtland_Report.html</a>
1990	<i>Talloires Declaration</i> , University Presidents Conference, France <a href="http://www.ulsf.org/programs_talloires.html">www.ulsf.org/programs_talloires.html</a>
1991	<i>Halifax Declaration</i> , Conference on University Action for Sustainable Development, Canada <a href="http://iisd.ca/educate/declarat/halifax.htm">http://iisd.ca/educate/declarat/halifax.htm</a>
1992	<i>Report of the United Nations Conference on Environment and Development; Chapter 36: Promoting Education, Public Awareness and Training</i> <a href="http://www.un.org/esa/sustdev/agenda21chapter36.htm">www.un.org/esa/sustdev/agenda21chapter36.htm</a>
1993	<i>Kyoto Declaration</i> , Ninth International Association of Universities Round Table, Japan <a href="http://iisd1.iisd.ca/educate/declarat/kyoto.htm">http://iisd1.iisd.ca/educate/declarat/kyoto.htm</a>
1993	President's Council on Sustainable Development (PCSD) is created. Public Linkage, Dialogue and Education Task Force established <a href="http://clinton2.nara.gov/PCSD/">http://clinton2.nara.gov/PCSD/</a>
1993	<i>Swansea Declaration</i> , Association of Commonwealth Universities' Fifteenth Quinquennial Conference, Wales <a href="http://iisd1.iisd.ca/educate/declarat/swansea.htm">http://iisd1.iisd.ca/educate/declarat/swansea.htm</a>
1993	<i>Copernicus University Charter</i> , Conference of European Rectors (CRE) <a href="http://www.copernicus-campus.org/">www.copernicus-campus.org/</a>
1994	National Forum on Partnerships Supporting Education about the Environment, National Science and Technology Council <a href="http://www.gcric.org/edu/pcsd/intro.html">http://www.gcric.org/edu/pcsd/intro.html</a>
1994	Yale University Campus Earth Summit (Report: Blueprint for a Green Campus) <a href="http://www.princeton.edu/~rcurtis/earthsum.html">www.princeton.edu/~rcurtis/earthsum.html</a>
1995	<i>Education for Sustainability: An Agenda for Action</i> (President's Council on Sustainable Development) <a href="http://www.gcric.org/edu/pcsd/toc.html">http://www.gcric.org/edu/pcsd/toc.html</a>

## CHRONOLOGY OF EVENTS AND DECLARATIONS RELATED TO EDUCATION FOR SUSTAINABILITY, CONTINUED

YEAR	EVENT / DECLARATION
1995	Workshop on Implementing Sustainable Development at the University Level, Bradford, UK <a href="http://www.fns.uniba.sk/zp/greenway/26/3.htm">www.fns.uniba.sk/zp/greenway/26/3.htm</a>
1995	Workshop on the Principles of Sustainability in Higher Education, Massachusetts (Essex Report), ULSEF, Second Nature, and the President's Council on Sustainable Development
1996	The International Work Programme on Education, Public Awareness and Training for Sustainability adopted by the UN Commission on Sustainable Development <a href="http://www.un.org/esa/sustdev/sdissues/education/edu.htm">www.un.org/esa/sustdev/sdissues/education/edu.htm</a>
1996	Ball State University (Indiana) Greening of the Campus conferences (also 1997, 1999, 2001, and 2003) <a href="http://www.bsu.edu/provost/ceres/greening">www.bsu.edu/provost/ceres/greening</a>
1996	<i>Sustainable America: A New Consensus for Prosperity, Opportunity and a Healthy Environment for the Future</i> , (President's Council on Sustainable Development) <a href="http://clinton2.nara.gov/PCSD/Publications/TF_Reports/amer-top.html">http://clinton2.nara.gov/PCSD/Publications/TF_Reports/amer-top.html</a>
1997	<i>Thessaloniki Declaration</i> , International Conference on Environment and Society - Education and Public Awareness for Sustainability <a href="http://www.mio-ecsde.org/Thess/TOCThess.htm">www.mio-ecsde.org/Thess/TOCThess.htm</a>
1997	<i>From Classroom to Community and Beyond: Educating for a Sustainable Future</i> , Report of the Public Linkage, Dialogue, and Education Task Force of the President's Council on Sustainable Development <a href="http://clinton2.nara.gov/PCSD/Publications/TF_Reports/linkage-top.html">http://clinton2.nara.gov/PCSD/Publications/TF_Reports/linkage-top.html</a>
1998	World Conference on Higher Education, Paris <a href="http://www.unesco.org/education/educprog/wche/eng.htm">www.unesco.org/education/educprog/wche/eng.htm</a>
1999	World Conference on Science, Budapest <a href="http://www.unesco.org/science/wcs/">www.unesco.org/science/wcs/</a>
2000	<i>Earth Charter</i> , born out of an initiative at the 1992 Rio Earth Summit <a href="http://www.EarthCharter.org">www.EarthCharter.org</a> and <a href="http://www.EarthCharterUSA.org">www.EarthCharterUSA.org</a>
2000	World Education Forum (Education for All), Dakar <a href="http://www.unicef.org/efa/">http://www.unicef.org/efa/</a>
2001	<i>Lüneburg Declaration on Higher Education for Sustainable Development</i> , Germany <a href="http://www.lueneburg-declaration.de/downloads/declaration.htm">www.lueneburg-declaration.de/downloads/declaration.htm</a>
2002	World Summit on Sustainable Development, South Africa (Type I outcome: United Nations Decade of Education for Sustainable Development, slated to begin in 2005; Civil Society outcome: <i>Ubuntu Declaration</i> —see Appendix A) <a href="http://www.johannesburgsummit.org/">www.johannesburgsummit.org/</a>
2002	IUCN Commission on Education and Communication Conference <a href="http://www.iucn.org/cec/">http://www.iucn.org/cec/</a>
2002	Adoption of the <i>Draft Resolution on the United Nations Decade of Education for Sustainable Development</i> at the United Nations General Assembly, December 20, 2002 <a href="http://www.mofa.go.jp/policy/culture/education0212.html">http://www.mofa.go.jp/policy/culture/education0212.html</a>
2003	<i>National Conference on Science, Policy and the Environment: Education for a Sustainable and Secure Future</i> . National Council for Science and the Environment, January 30-31, 2003. <a href="http://www.NCSEonline.org/EFS">http://www.NCSEonline.org/EFS</a>

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# CHAPTER 2: RECOMMENDATIONS FOR EDUCATION FOR A SUSTAINABLE AND SECURE FUTURE

summary of primary recommendations and themes

detailed recommendations by breakout session topic:

Business Education	Geographic Learning	Planetary Health
Corporate Leadership	Green Campuses	Population-Environment
Community Education	International Challenges	Public Communication
Diversity	K-12 Content	Sustainability-Security Curricula
Educational Research	K-12 Implementation	Sustainable Practices
Environmental Majors	Large Scale Conservation	Teacher Professional Development
Environmental Security	Natural History	Undergraduate Education

breakout session chairs, facilitators, and presenters

# SUMMARY OF CONFERENCE RECOMMENDATIONS

## OVERARCHING THEMES

- Simultaneously protecting the environment and providing for economic and personal well-being is the path to human security and the foundation, in the long-term, for global security.
- Education is essential for human and global security.
- Education for sustainability needs to be infused across the educational enterprise for life-long learning.
- Inclusiveness and diversity are essential in all aspects of education, including content, participation, disciplines and approaches.
- Interdisciplinary approaches to research and education are essential to understanding and resolving complex environmental and social issues.
- Experiential, inquiry-based, team-building, problem-solving, systems approaches and critical thinking are essential attributes of education.
- Education should help students to identify values, assumptions and ethical systems in order to help students to make their own decisions.
- People need to understand geospatial and temporal frames of reference and the context of information.
- Curricula need to be developed, including content, materials and tools such as case examples and identification of best practices.
- Sustainability concepts need to be incorporated into existing accreditation systems.
- Messages need to be developed that connect sustainability to personal core values. Public communication and media campaigns are needed to present these messages.
- Institutions (schools, businesses, agencies and other organizations) must become leaders in “practicing what we teach” through adopting sustainable practices (activities, culture, personal relationships and community involvement) and creating sustainable facilities that are integrated with teaching and learning.
- Baseline information is largely absent in all aspects of sustainability education and practice.
- Criteria to measure success must be developed and implemented.
- Support is necessary for the continuum of professional development, from educators to practitioners in sustainability and environmental education.
- Funding and other incentives are necessary for any of the above to happen.

## PRIMARY RECOMMENDATIONS

Below is a summary of the primary recommendations developed for sustainability education. Specific recommendations for each aspect of education are found under the appropriate breakout session heading in this chapter.

### **Identify sustainability education needs and practices**

- All children should be educated regarding the value of diversity within American society and among societies across the globe.
- Research on how people learn about the environment should be conducted and incorporated into educational practices.
- Core competencies in environmental and sustainability education should be identified through synthesis of previous efforts and workshops to reach common agreement.
- A baseline inventory of government and other programs and funding for environmental and sustainability education should be conducted and repeated at periodic intervals.
- Schools and other institutions should conduct baseline assessments of their practices with respect to sustainability and systematically monitor their progress.

### **Develop sustainability education standards and programs**

- Standards should be developed that incorporate sustainability principles into learning.
- Graduate courses and programs should be developed to help people understand the relationships between human demography and the environment.
- Any education or communication strategy should be subject to the “seven-generation test” to ensure sustainability.

### **Facilitate the teaching of sustainability concepts**

- Guidelines and resources are needed to help educators and communicators understand and teach about the linkages between sustainability and security.
- State departments of education should encourage experiential, science-based, analytical, and synthetic learning.

- Tenure and promotional criteria should reward interdisciplinary education and research.
- Sabbaticals and other opportunities should be created for mid-career professionals to gain new perspectives on sustainability.
- Clearinghouses are needed to help educators identify mentors, practices, curricula, and other resources.

### **Communicate sustainability concepts the public**

- A group is needed to define a framework and process to create a clear and inspiring message on sustainability, including an effective marketing strategy that connects to personal core values.
- Communities should create multi-disciplinary service centers (utilizing resources such as libraries and universities) so that community members can access information and individuals with expertise to help them meet their own goals for sustainability.
- The Earth Charter is a valuable means of educating about global interdependence and shared ethical bases of sustainability.

### **Foster business leadership of sustainable practices**

- Business leadership for sustainability should be fostered by linking sustainability and stakeholder values and presenting case examples in training, education, and development.
- Business associations and others with credibility to business school deans and faculty should exert leadership in encouraging business schools to infuse sustainability into their curriculum.

# BUSINESS EDUCATION

## Transforming Education at Business Schools

The choices that business leaders make with respect to products, production methods, markets, and investments have tremendous repercussions on the environment and on quality of life. Yet few business leaders have been educated about how to provide environmental stewardship in their businesses; fewer still see the competitive opportunities of sustainable and restorative business models. Similarly, few business schools devote more than cursory attention to sustainability and the natural environment.

**INFUSING SUSTAINABILITY INTO THE MANAGEMENT CURRICULUM** offered by business schools would reach a high percentage of future business leaders, and foster corporate leadership in sustainable practices. Because business schools are highly customer-oriented, business involvement in reforming the curriculum is critical.

### 1. Overarching recommendation

It is necessary to examine the barriers to sustainability in management education, both institutional and environmental, and seek cooperative solutions that draw on the knowledge and resources of academia, business, government, and nongovernmental organizations.

### 2. Research

- Those seeking to infuse sustainability into business school curricula should learn from past attempts to alter curricula.
- Funding should be provided for proposals to analyze past and current attempts to change curricula, including analysis of factors that led to success or failure.
- Research should examine past attempts to integrate topics such as quality concepts, international business, women's studies and ethics into business education as well as how sustainability has been infused into subjects other than management.

### 3. Hiring practices

A study should be conducted to identify the demand for managers who understand sustainability with respect to business and to analyze business hiring practices for such individuals.

### 4. Accreditation

Accrediting bodies such as the Association for the Advancement of Collegiate Schools of Business (AACSB) should incorporate sustainability education into accreditation standards.

### 5. Business leaders

- Expert speakers (respected academics, program chairs and deans, industry representatives), businesses and groups with credibility to business school faculty should speak to business school deans and faculty about the importance of infusing sustainability concepts into business education.
- Business associations such as Businesses for Social Responsibility, Global Environmental Management Initiative, Business Roundtable, The Conference Board and the World Business Council on Sustainable Development should exert leadership in encouraging business schools to infuse sustainability into their curriculum.
- Company representatives on business school advisory boards should be more assertive advocates for sustainability.

### 6. Publishers

Publishers and developers of curriculum resources should support and increase recognition for teaching cases and incorporating case studies into textbooks, including:

- Funding for case study development
- Funding to support presentation of sustainability case studies at academic conferences
- Special editions of peer reviewed case study journals
- Development of a full range of sustainability annexes to leading disciplinary textbooks
- Identifying “zero content tradeoff” options for infusing sustainability into main body of leading textbooks.

# CORPORATE LEADERSHIP

## Sustainability, Education, and Economic Opportunities

At the 2002 World Summit on Sustainable Development, the environment was linked with economics, demonstrating the need for corporate action on sustainability. Tied to the discussion of sustainability is the issue of corporate social responsibility. Innovative businesses have begun to incorporate sustainable practices in their decisionmaking, and leaders in corporate social responsibility are demonstrating the benefits of sustainable practices.

### 1. Overarching recommendations

As companies improve the sustainability of their actions, several steps must be taken:

- Set a positive agenda for innovation. Reward and recognize those innovators who are looking toward the future. Seek ways to use existing tools, such as the ISO 14001 environmental management system, to promote sustainability.
- Embed sustainable values throughout the corporation. A foundation of integrity and ethical values must be deeply integrated in a company's value system and expressed in its operations and rewards systems.
- Infuse sustainable values throughout the community. Corporations demonstrating a commitment to sustainability can lead other corporations and individuals to undertake sustainability practices that benefit their communities.

### 2. Corporations

- Literacy. Corporations should foster ecological literacy at all levels of learning within the corporation and within the community at large.
- Leadership. Corporations, business associations, academia and non-governmental organizations should foster business leadership for sustainability through training, education and professional development opportunities.
- Authenticity. Corporations should demonstrate the authenticity of their commitment by assessing the "sustainability footprint" of the corporation and disseminating this information to the public.

- Experiential Learning. Corporations should provide opportunities for experiential learning opportunities in sustainability for employees and sponsor opportunities for projects with community, elementary school, secondary school, and university partners.

### 3. Proponents of sustainability

- Case Studies. Proponents of sustainability should develop case studies that link sustainability and shareholder value over the short and long term and present these studies to corporate leadership and share with other companies.
- Transparency. Proponents of sustainability should encourage corporate transparency on sustainability through development of mechanisms such as third-party verification and communication of results to the public.
- Communication. Proponents of sustainability should encourage sustainable business practices by communicating best practices through education, mentoring and networking opportunities.

### 4. Researchers

- Research. Government agencies, non-governmental organizations, professional and business associations and educational institutions should sponsor and conduct research on sustainability and innovation.
- Historical record. Researchers should examine the historical and often positive record of businesses on sustainability and environmental issues.

# COMMUNITY EDUCATION

## When the Community is the Classroom

To be successful, community-based education must be a collaborative process where community members are involved in setting goals, gathering information, and implementing effective outreach strategies. The “community” may be a community of place, a community of identity, or a community of interest. In each situation, the intent is to build the skills of citizens to gather, analyze, and apply information for making informed decisions on issues that affect the environment.

### 1. Resources

Communities should create multi-disciplinary service centers (utilizing resources such as libraries and universities) with trained staff so that community members can obtain information and expertise to help them meet their own goals for sustainability.

### 2. Roles of universities and colleges

- Universities and colleges should see community education as integral to their mission, training researchers in methodologies of community-based research, and encouraging researchers to communicate research to diverse groups (the public, religious and non-governmental organization, etc.).
- Universities, colleges, and agencies should seek out successful projects and models, develop case studies and disseminate them broadly, and fund mentorship programs.

### 3. Cultural sensitivity

- Those involved in community education should develop and practice culturally sensitive approaches, making sure that community members are involved in recommendations and implementation.
- Educators should provide programs that engage citizens who are not already engaged in sustainability, identifying and providing incentives and strategies for them to undertake sustainable practices in their daily lives.

### 4. Standards and indicators

- Education institutions of all types from pre-school to adult should address sustainability by implementing standards, encouraging development of links to the community (including multigenerational activities), and finding and filling gaps in materials for sustainability education.
- Educators, researchers, and community members should develop a set of indicators to determine success or failure of sustainability education and implementation at the local level.

### 5. Outcomes and partnerships

- Action-oriented outcomes should be priority in community education, in part by making the principles of social marketing widely available to groups involved in community education.
- Communities should create partnerships with businesses within the community to increase support for local and regional projects and to help demonstrate linkages between environmental values and economic decisionmaking.

### 6. Clearinghouse for educators

A federal agency or national organization should develop and maintain a resource for community sustainability educators to share ideas and resources among themselves and to respond to individual questions and requests for guidance.



# DIVERSITY

## Human Diversity in Education for a Sustainable and Secure Future

Human diversity encompasses difficult issues such as race, ethnicity, social class, gender, sexuality, and religion in contemporary society. Sustainability can be achieved only when there is honest dialogue and sustained interaction among all stakeholders, whose multiple perspectives are taken into account. This requires a higher-ordered thinking on diversity—one not based on traditional perspectives of duality such as white/black or female/male. Education is needed to cultivate an understanding and acceptance of social, cultural, linguistic, and other types of diversity measures such as demographic and health status identifiers. Institutional leadership and infusion of diversity concepts throughout all educational endeavors creates an enriching setting that fosters individual action and responsibility as well as meaningful and fair collaborations.

### 1. Overarching recommendation

- Increase human diversity in science and education funding, policy, research, and decisionmaking.

### 2. Education about diversity

- All children should receive instruction about the historic value of diversity in American society.
- A national K-12 curriculum should be developed and implemented that is tied to a measurable set of environmentally-focused learning objectives and includes recognition of the human diversity of students, faculty, communities, and society as a whole.
- There should be a national public education media campaign about global perspectives regarding diversity.

### 3. Diversity science

- Research should be conducted to understand human diversity in a social and cultural context and to characterize the strengths and advantages of human diversity.

### 4. Demonstrating diversity

- Educational institutions should implement policies and programs that result in increased human diversity in environmental fields.
- Professional organizations and associations should increase the diversity among their leadership and senior staffing positions.
- Diversity should be more strongly promoted and sustained in education programs nationally and internationally.
- Governmental, nongovernmental, science and education organizations and corporations need to define and implement their diversity policies.
- Educational institutions should promote practical environmental programs that can be related to content learned in classes.

- Colleges and universities should direct substantive funding for diversity initiatives, especially scholarships and fellowships, with eligibility to be inclusive of foreign students on the campuses.
- All conferences dealing with the myriad issues associated with environment and sustainability should demonstrate and ensure diversity in all aspects of program design, participation and session content.

### 5. International partnerships

- The United States and other western nations should encourage existing initiatives and participate as peers in supporting new initiatives grounded in thoughtful partnerships with emerging nations that advance solutions to issues of human diversity in education and society.
- The United States and other western nations should recognize the historical value and contributions to international society made by scientific endeavors currently underway in other countries.

### 6. Funding

- Funding organizations should utilize the strengths of our diverse population, supporting culturally relevant environmental education to achieve solutions to environmental problems.
- Federal, state, and local government, and private funders should increase funding and support long-term grant commitments to enable and expand environmental education at minority serving institutions.
- Substantial federal funding must be provided on an ongoing basis to address national issues of workforce diversity

# EDUCATIONAL RESEARCH

## Suggested Guidelines for Education for Sustainable Development Research

According to Chapter 36 of Agenda 21 (see page 14), education for sustainable development (ESD) has four major thrusts: basic education, reorienting existing education, developing public understanding and awareness, and training. The realms of educational efforts include programs, practices and policy. Within the next decade, hundreds of school systems, universities, nongovernmental organizations, governmental agencies, and other institutions will implement changes related to sustainability and education. It is essential to measure whether or not these efforts are successful. With the help of research, the education community can share successes, avoid duplicating pitfalls, and track the changes that will occur as a result of reorienting education to address sustainability.

### 1. Attributes of ESD research

- Research should reflect that (ESD) ought to be locally relevant and culturally appropriate for all stakeholders.
- Research should assess student well-being, not simply academic performance.
- Research should assess the ability of citizens to have critical thinking skills, to take actions, and to articulate different points of view.
- Research should involve all three realms of sustainability—environment, society, and economy.
- Baseline information on the status of ESD should be established early so that comparisons in the future can be made to the baseline information in order to assess whether or not programmatic changes have been effective.
- Research should evaluate the extent to which ESD is helping individuals, communities, provinces, and nations reach their sustainability goals.
- Research at the national, provincial/state, and local levels should be cataloged and published in easily available and inexpensive formats so that program and curriculum developers can learn and benefit from the research.
- Research results should be incorporated into improvement of educational programs, practices, and policies.

### 2. Creating education research agendas

Practitioners, researchers, and other stakeholders in individual nations, states, provinces, cities, schools,

agencies, institutions, and organizations should collectively create research agendas for ESD, appropriate to their unique environmental, social, and economic context, needs, goals, and resources.

#### • Create a common language

- Because ESD will involve the efforts of researchers, practitioners, and stakeholders from many different disciplines, interests, and backgrounds, efforts must be made to ensure that the dialogue is transdisciplinary and includes the “languages” of different disciplines.
- Because sustainability and education come from many traditions around the world, and because many disciplines are involved in ESD, it is necessary to define frequently used terms to create a common language for discussion.

#### • Set priorities

- Those setting research agendas should begin by considering the overarching issues about education and sustainability within the context of the nation or organization that is creating a research agenda.
- All short-term and long-term priorities for research must be defined within the context of the community and of sustainability.
- The short- and long-term priorities must be linked and explicit.
- For many priorities, developing baselines will allow documentation of progress over time.

## EDUCATIONAL RESEARCH

### Suggested Guidelines for Education for Sustainable Development Research (continued)

#### 3. Elements of an education research agenda

The following elements should be included in an education research agenda:

- **Conceptual process** to think through the steps of developing a research agenda, in which developers:
  - Identify desired outcomes and vision of a sustainable society.
  - Factor in the different elements of sustainability.
  - Assess the most salient barriers and problems to reaching the desired outcomes and the strengths for reaching the desired outcomes in each of those areas.
  - Catalogue what is known in the research literature related to the desired outcomes.
  - Define how information flows through the target population or audience.
  - Perform a gap analysis to identify needs to be filled.
  - Define how to implement the agenda.
- **Data collection** based on the conceptual process.
- **Ways to extend the dialogue** by linking with, mobilizing, and using existing human resources, bringing together researchers and practitioners; educators and communicators.
- **Strategy of promotion and promulgation** of the research agenda, which includes moving the plan from theory to action to make it a reality, and determining how to sustain the effort.

#### 4. Communication

- For a research agenda to be successful over the longer term, it should outline ways to encourage and sustain dialogue among researchers, practitioners, and stakeholders.
- Reporting, sharing, and disseminating research findings and data must occur regularly and frequently.
- There should be a “clearinghouse” dedicated to ESD, which should include program evaluations as well as basic research.
- The overall strategy of promotion of the ESD research agenda should engage researchers, practitioners, and users of the data from many different disciplines.
- Research should include non-formal and informal education and public communication, covering the entire human life-span. Community-based programming, mass media, and specialized communication to decisionmakers should be used to present the research agenda and findings.

# ENVIRONMENTAL MAJORS

## Curricular Needs for Environmental Sciences and Environmental Studies Degree Programs

The Council of Environmental Deans and Directors is an association of leaders of academic environmental programs at U.S. universities and colleges. They have come together to improve the quality, stature and effectiveness of the environmental field. CEDD is facilitated by the National Council for Science and the Environment as part of its University Affiliate Program.

**THE CEDD TASKFORCE** on Curriculum is working to improve the strength and credibility of academic environmental programs. The Taskforce has developed a draft document, "Core Competencies for Undergraduates in Environmental Programs, which identifies the basic assumptions, core competencies, and some area-specific competencies of undergraduate environmental education. The Taskforce hosted this session to gather input on the draft document from the academic environmental community, as well as thoughts on what steps should be taken next to define and implement a framework document stating what makes environmental programs unique in teaching skills, knowledge and perspectives not found in traditional disciplinary programs.

### 1. Key questions

- What skills, knowledge and perspectives make environmental programs unique? (For example, what skills, knowledge and perspectives does a graduate from an environmental program have compared with a graduate from a traditional disciplinary program?)
- What are the commonalities among various environmental programs? (For example, what does a graduate from an environmental chemistry program share in common with a graduate from an environmental policy program?)
- Is there a core canon of environmental education, and is it useful to identify such a canon?
- What improvements in programs and their curricula are necessary to improve the educational experience of undergraduates and graduates?

### 2. Recommendations for follow up by the

- Council of Environmental Deans and Directors
- Host an intensive workshop to draft a document that will be circulated for comment to the academic community.
- Reference and build on previous work to identify competencies.
- Incorporate comments to create a living document that can be presented to academic administrations, prospective students and employers to improve environmental programs.
- Focus on adoption and implementation by leaders of academic environmental programs, in order to strengthen undergraduate environmental education.
- Communicate to university and college administrators, prospective students, and employers about the value and potential of environmental education at the college level.

# ENVIRONMENTAL SECURITY

Environmental Security is the maintenance, restoration, and protection of ecosystem services, such as soil productivity, availability of water, pollination, and other services. These services are essential to the maintenance of all living systems, including human-constructed social, political, and economic systems. Education across all sectors is important to understand and achieve environmental security.

## 1. Research

- Funding agencies like the National Science Foundation should support multidisciplinary research on the complex social, political, economic, and cultural relationships inherent in environmental security issues.
- Federal resource management agencies and educational institutions should promote transboundary, collaborative, multidisciplinary cooperation on the science and management of ecosystem services.
- Federal resource management agencies and educational institutions should jointly develop concrete strategies and tools aimed at critical analysis, understanding, and interpretation of complex ecosystem interactions and dynamic relationships, such as dynamic simulation modeling.

## 2. Policy and activities

National decisionmakers need to include ecosystem science and scientists in national security policies and activities where they relate to the environment.

## 3. Education

- Educational programs should be developed to build intellectual capacity, awareness, and emergency preparedness to deal with chronic and acute ecological degradation and its consequences.
- Private foundations and nongovernmental organizations in environmental education should support and encourage curriculum design in primary and secondary school programs on the subjects of ecological sustainability and the vulnerability of ecosystem services.

## 4. Public communication

The public media should be encouraged and assisted to convey the understanding derived from research in environmental security.

# GEOGRAPHIC LEARNING

## Designing National Programs for Local and Global Impacts

The environment and sustainability are more than a local issue—local activities may also have effects at regional, national and even global scales. New tools of geographic analysis, such as geographic information systems (GIS), allow researchers and planners to visualize problems and solutions at a variety of scales.

**GEOGRAPHIC ANALYSIS IS ESSENTIAL IN ALLOWING PEOPLE TO EVALUATE** whether an activity, process, product is sustainable by examining the impacts of consumption of materials and use of resources across spatial scales and over time. These tools, along with fundamental geographic knowledge, have great value in education by allowing people to develop a sense of place that transcends the local environment. Thus people can simultaneously “think and act locally and globally”.

### 1. Sustainability education

- National programs should promote the incorporation of geographic learning into sustainability education.
- Sustainability educators should develop ways to interject sustainability into discussions of on-going national issues.
- Sustainability education should emphasize the importance and consequence of individual action and the interrelations of individuals, communities and global systems.

### 2. Teacher professional development

There should be a national effort to assist teachers in learning how to teach about sustainability, using tools of geographic analysis.

### 3. Informal education

Informal teaching about sustainability should foster geographic learning and link to popular culture and mass media.

### 4. Teaching tools

Geographic educators should form partnerships with cognitive scientists and develop learner-centered tools for geographic analysis that are customized for teachers in the classroom.

### 5. Educational technology

Educational institutions at all levels should provide students with the opportunity to learn how to use state-of-the art technology and software to think critically, make decisions, solve problems, and visualize solutions to address issues of sustainability.

### 6. Integrating geographic education

- Geographic education should be more integrated with social, environmental, science, and economic content and contexts.
- Geographic education must have a component of problem-solving that addresses sustainability.

## Geographic Learning

### Designing National Programs for Local and Global Impacts (continued)

#### 7. Core curriculum

- The core curriculum for elementary and secondary education must integrate physical, social and economic geography with other fields of study.
- Every high school student should take a geography course as part of the core curriculum.

#### 8. Research

- Research programs should be designed so that participants collect and use real data to address local issues.
- Research programs should include a range of spatial and temporal scales in their analysis.

#### 9. Role of the National Science Foundation

The National Science Foundation should continue to expand its approach toward integrative sciences by including a focus on environmental sustainability in every program announcement.

#### 10. Academic rewards system

The academic rewards system should promote interests and efforts to increase an interdisciplinary focus on sustainability.

#### 11. National clearinghouse

There should be a national clearinghouse on sustainability education so that people can find mentors, practices, curriculum, and other resources.

#### 12. Developing solutions for society

Educators and researchers should consider all aspects of sustainability (environmental, economic and social) simultaneously to work toward viable solutions that will be adopted by society.

# GREEN CAMPUSES

## Creating Green Campuses: Practicing What We Teach

As institutions of research, teaching and public service, colleges and universities should be finding and refining the best practices for developing a sustainable environment. Campuses should, as much as possible, set an example by demonstrating the best practices in sustainable design. In so doing, they would become living laboratories for the continued research and refinement of environmental practice and knowledge. These “green campuses” would demonstrate the potentials for greater public application. They would serve as environments in which the future scientists, teachers and practitioners are educated not only in the traditional sense, but by “immersion” and service learning.

### 1. Educating for sustainability

- Scientists and educators should make the case to society at large of the value of sustainability.
- Scientists and educators should help decisionmakers and other agents of change understand the linkages between actions and consequences (including consequences for security, equity, and human health).
- Colleges and universities should promote the teaching of whole system design (life cycle analysis).
- Colleges and universities should remove barriers to cross-disciplinary and cross-sector collaborations.

### 2. Implementing sustainability on campuses

- Colleges and universities should establish resource teams to undertake institutional sustainability assessments and conduct other evaluations of their practices.<sup>12</sup>
- College and universities should form voluntary sustainability committees and hire staff for sustainability offices.
- College and university decisionmakers should develop financial timelines that take into account long payback times for sustainability projects.
- Colleges and universities should promote student-to-student interactions on sustainability projects.

### 3. Information clearinghouse

There should be an international clearinghouse for information about campus and community sustainability projects.

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<sup>12</sup>A project is currently underway to create a higher education sector supplement for the Global Reporting Initiative to standardize sustainability reporting for higher education worldwide. Contact University Leaders for a Sustainable Future at [info@ulsf.org](mailto:info@ulsf.org). Also, the Campus Sustainability Assessment Project (Western Michigan University) provides the most comprehensive database of campus assessments. See [www.scap.envs.wmich.edu](http://www.scap.envs.wmich.edu).



# INTERNATIONAL CHALLENGES

## After the World Summit on Sustainable Development and Toward the UN Decade of Education for Sustainability

Following the World Summit on Sustainable Development (WSSD) and looking forward to the UN Decade of Education for Sustainable Development (2005-2015), there are many opportunities for higher education institutions to provide leadership in sustainable development.

**INTERNATIONAL PARTNERSHIPS ARE BEING FORMED**, such as the Global Higher Education for Sustainability Partnership (GHESP), which includes UNESCO, the International Association of Universities, Copernicus-Campus, and University Leaders for a Sustainable Future. These partnerships need to identify critical agendas and work to advance higher education for sustainable development internationally.

### 1. Coalition for the World Decade of Education for Sustainable Development

- There should be an international coalition of governmental and nongovernmental partners to develop a process and strategy for implementing the World Decade of Education for Sustainable Development, which begins in 2005.
- The process should include an awareness campaign for American educators on sustainable development, and on the Decade.
- The strategy should incorporate measurable outcomes to help define and ensure the success of the Decade.

### 2. Interdisciplinary research and teaching

- Higher education institutions should provide specific incentives and funding for interdisciplinary research and teaching.
- All colleges and universities, including undergraduate, graduate, and professional schools, should develop required courses on global challenges and sustainable development.

### 3. International partnerships

- U.S. institutions of higher education should build partnerships with institutions in developing countries and focus on sustainability in teaching, research, outreach and operations.
- All colleges and universities should develop international exchange programs and opportunities for graduate, undergraduate and mid-career students to explicitly focus on the study of sustainable development (and on experiential learning in this area).

### 4. Earth Charter and ethical dimensions

All colleges and universities should initiate programs to address the ethical dimensions of sustainability, based on the Earth Charter.<sup>13</sup>

### 5. Awards

A major foundation should create an endowment for prestigious awards to individuals and institutions that demonstrate leadership in education for sustainable development.

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<sup>13</sup>The Earth Charter, completed in 2000. <http://www.earthcharter.org>

# K-12 CONTENT

## Identification of Essential Learnings at the K-12 Level

Education for sustainability incorporates five themes: stewardship, the future, global issues, communities and economics. These themes should be essential components of elementary and secondary education.

### 1. Teacher education (pre-service and in-service)

- Teachers at all levels should become educated to understand connections among economic, environmental and social factors.
- Educational leaders should develop methods and resources to help teachers envision the future and think at least one generation ahead.
- Teachers should be provided release time to become educated regarding teaching about sustainability.
- Sustainability practitioners should work with teachers.

### 2. Standards and assessments

- Educational standards should incorporate sustainability concepts.
- Researchers and educators should evaluate the impact of education for sustainability on student learning and achievement.

### 3. Community education, school partnerships and real-world knowledge

Educators should formulate and utilize more outside school education (informal education) programs with sustainability themes.

### 4. Curriculum development and distribution

- Educational programs should connect children to their natural world.
- Educators should integrate sustainability concepts into writing and reading, beginning at the earliest grade levels.

- Educators should develop education for sustainability concepts and processes in ways to connect them with needs of teachers and students.
- Teachers should integrate sustainability themes into their curriculum and practices.
- Educators should create opportunities for service learning and other citizenship activities.
- Educators should incorporate global perspectives into their work.
- Educational leaders should create ways to integrate education for sustainability into teacher responsibilities.
- Textbook authors and publishers should integrate education for sustainability into their materials.
- Education for sustainability should be integrated into advanced placement courses.

### 5. Research

- Researchers should study the impact of education for sustainability upon people's behavior.
- Graduate students and other researchers should include pre-college students in their research activities.

### 6. Funding

Funding and other resources for educators throughout the educational system should be increased to allow for the development and incorporation of sustainability concepts into educational materials and practices.

# K-12 IMPLEMENTATION

## Integrating Environment and Sustainability across the K-12 Educational Enterprise

Today's students live in an increasingly urban, indoor world. Their access to nature is limited not only by that physical geography, but also by their hectic schedules, their parents' concerns about safety, and their school's focus on textbook presentation.

**FOR MANY, THEIR PRIMARY SOURCE OF INFORMATION ABOUT NATURE IS TELEVISION.** Recycling, energy conservation, and endangered species "facts" are the extent of environmental learning in many schools. Environmental information lives in a TV or in a book, but not in the student's daily experience. Without hands-on personal ownership, students fail to link the "What" to "Why" and or "Why should I care." It is time to focus on successful strategies and work to integrate environment and sustainability into K-12 education.

### 1. Overarching recommendation

Environmental and sustainability education is an essential element of K-12 curriculum that should be infused and integrated across all disciplines.

### 2. Policy

- K-12 policy must include education for sustainability as a core priority.
- Resources must be allocated for research and implementation of sustainable practices and ideas.
- Federal and state governments should include standards for and appropriate assessment of comprehension of environmental and sustainability concepts and issues.

### 3. Schools

- Schools should connect students with their environment and their community, promote community service in environmental stewardship, and engage students in long-term environmental projects.
- Schools should foster the development of problem-solving skills, higher order thinking, and inquiry, using experiential methods that focus on the local environment and community and link to global issues.
- Schools should integrate subjects across disciplines and facilitate student understanding and application of systems thinking (the interactions between human and natural systems).

- Schools should provide opportunities for students to explore and develop their own values about these issues.
- Schools should model sustainability through their facilities, culture, personal relationships, and community involvement.
- Schools should form strategic partnerships with non-formal education organizations, such as nature-centers, zoos, aquariums, museums, parks, 4-H, and scouting and conservation groups.

### 4. Professional development

- Pre-service and in-service teacher training should emphasize inquiry-based learning and integrated systems-based thinking, leading to problem-solving in teaching and learning.
- Career teachers need frequent opportunities to continue their education through participation in high quality professional development with colleagues across disciplines and grade levels.
- Teachers need time and support to collaborate with their colleagues to develop interdisciplinary projects addressing sustainability.

# LARGE SCALE CONSERVATION

## Integration of Education and Large Scale Conservation

Conservation groups, government agencies, and multi-national organizations are scaling up conservation efforts to achieve greater success in protecting biodiversity for the future. In many cases, this means working across political boundaries to target biogeographic landscapes in large-scale conservation projects. It also means focusing on multiple scales, from local to regional and beyond. Education has an important and often overlooked role as agencies and organizations engage stakeholders in conservation at larger geographic scales. Partnerships and training are essential keys to incorporating education as a tool for conservation.

### 1. Policy

The President should issue an Executive Order that establishes a national conservation education training policy for all conservation professionals. This policy will help natural resource managers develop the competencies necessary to integrate education into large-scale conservation.

### 2. Capacity-building

Agencies, universities, nongovernmental organizations (NGOs), and others responsible for training professionals in large-scale conservation should ensure that:

- training programs prepare educators to work collaboratively with specialists in other disciplines;
- specialists in non-educational fields value the contribution of educators and the critical need for linking the conservation and education communities; and
- educators and conservation professionals create information, resources and strategies for conservation efforts linking community and school partners.

### 3. Learning from others

Agencies, universities, NGOs and funders working in large-scale conservation should promote cross-jurisdictional and interdisciplinary staff training and capacity building. Multi-way learning and exchange of professionals from U.S. and other countries helps to build and share local knowledge.

### 4. Learning from nature

Public land managers should seek to establish outdoor learning opportunities with local schools and universities to promote inquiry- and discovery-based learning and local stewardship of natural resources. Long-term partnerships with local schools can enhance conservation values at the community level and promote conservation workforce skills.

### 5. Clearinghouse

A consortium including agencies, universities, and NGOs should identify and catalogue success stories in conservation education and make them available in a national archive or clearinghouse that includes online access. The archive should include examples of where federal agencies are collaborating and sharing resources. The National Conservation Training Center may be an appropriate home for such an archive.

### 6. Appropriate access

Professional conservation educators should ensure that materials and training are appropriate and accessible for target audiences by using a participatory development process that represents diverse cultures, interests, and backgrounds.

### 7. Research funding

The National Science Foundation (NSF), universities, foundations, and other federal and state agencies should fund research on:

- learning across geopolitical, social, and institutional boundaries in order to build capacity for large-scale conservation, and
- how to achieve and evaluate this learning.

### 8. Economics

Agencies, educational institutions, and NGOs should educate constituents, students, and members about the tensions between economic growth and ecological, economic, and social sustainability.

# NATURAL HISTORY

## The Revitalization of Natural History Education

Nature sustains human life, shapes human history, and links all cultures in a shared future. Understanding fundamental concepts about nature is essential to responsible citizenship and to human security. Natural history has always been the experiential foundation of environmental education and ecological learning.

**THIS EXPERIENCE IS ESSENTIAL TO UNDERSTANDING** contemporary environmental problems including threats to biodiversity, the sixth mega-extinction that is now taking place, and global climate change. Yet, field-based experience and access to nature has largely disappeared from the public education curriculum in North America. The average North American student (and his or her parents) has very little ability to identify local flora and fauna, distinguish between invasive and endemic species, or to describe biogeochemical cycles.

### 1. Environment as an integrating concept

- Because nature is the foundation for all ecological learning and sustainability education, the environment should be an integrating concept for education across the curriculum.
- Understanding natural systems and human connections with them should be an overriding educational priority.

### 2. Parental involvement

Parents should be involved with their children in the discovery and stewardship of nature, in order to develop an interest in science and to promote environmental literacy.

### 3. A professional society of natural history educators

- Natural history educators, including members from government, schools, academia, nature centers, parks, zoos, museums, and land trusts, should form a professional organization (henceforth known as “the society”) in order to reestablish the prominence of natural history for citizenship, community participation, and ecological literacy.
- The society should develop a white paper to outline the rationale, purpose, and virtues of natural history education.
- The society should work to increase opportunities for public involvement, interaction, and education in natural history through family and community organizations, worship communities, and media outlets.
- The society should cultivate a national network of accessible, convenient, visible, and local natural history observation sites in schoolyards, shopping centers, and playgrounds.

- The society should organize citizen groups, schools, and amateur naturalists, supported by scientists, in web-based efforts to collect, distribute, and evaluate citizen-generated natural history data.

### 4. Natural history training

The federal government should support a new national program of field-based natural history training sponsored by nature centers, teacher organizations, public resource management agencies and environmental studies programs to support and enhance the natural history skills and observation techniques of K-12 teachers and outdoor educators, and to provide instruction for place-based, schoolyard programs.

### 5. Research

The federal government should initiate and fund a comprehensive research program to investigate cognitive natural history—how people learn to observe nature at different stages of their development.

### 6. Safe sites

Governments and private organizations should increase opportunities for natural history education by providing sites that offer security and freedom to explore habitats without concerns for personal safety.

# PLANETARY HEALTH

## Integrating Human Health and Environmental Education

The health of current and future humans is being compromised by environmental degradation. Human health and environmental health are interdependent and ultimately inseparable. The environment is the primary health care delivery system; the disruption of environmental equilibrium threatens us with the greatest public health crisis imaginable. If we respond to ecological reality, human activity will be redirected to sustain the health of ecosystems and concurrently the health of humans.

**INTEGRATING HUMAN AND ENVIRONMENTAL HEALTH** will present great challenges to educators. Health care professionals and educators must develop an expanded and integrated perspective of health and consider their potential leadership in determining educational and social policies.

### 1. Overarching recommendation

- The sustainability of interdependent human and environmental health should be the primary focus of all educational, political and economic decisionmaking.
- Learning communities should transform to represent the interdependence of human and environmental health, focusing on:
  - Integrated thinking;
  - Systemic interconnections;
  - Understanding of natural limits;
  - Processes that empower self-directed community action; and
  - Common principles applicable at global, national, local, and individual scales.

### 2. Elementary schools

Elementary and secondary schools should adopt and incorporate a basic curriculum on the social and environmental determinants of health, including nutrition, physical education, food production, and community self-sufficiency.

### 3. Colleges, universities, and professional schools

Colleges, universities, and professional schools should expand the principles of interdependent human and environmental health into all disciplines and professional education programs, including law, business, engineering, architecture, and community and regional planning schools.

### 4. Education of health professionals

- All educational programs for all health professionals should develop and incorporate a mandatory core curriculum on the principles of sustainable human and environmental health, and training in diagnostic procedures that utilizes those principles.
- To educate public health professionals, the Association of Health Centers (AHC) should formally request that the Council for Accreditation of Schools of Public Health establish mandatory criteria that integrate the principles of sustainable human and environmental health.

## PLANETARY HEALTH

### Integrating Human Health and Environmental Education (continued)

#### **5. Health and medical research**

Scientific research programs focused on health and medicine should shift their focus and funding support from searches for reactive cures to research on causation, prevention and health promotion.

#### **6. Industry**

Industry should undertake initiatives that remove known or possible direct and indirect threats to interdependent human and environmental health.

#### **7. Communication with decisionmakers**

Scientists, educators and health professionals need to communicate with decisionmakers about the interdependencies between human and environmental health.

#### **8. Public awareness**

Highly visible public awareness campaigns should be undertaken that promote interdependent human and environmental health, and advocating individual and community responsibility and action.

#### **9. Urban and community development**

Urban and community developers should consistently apply the principles of sustainable interdependent human and environmental health.

# POPULATION-ENVIRONMENT

## Population-Environment Linkages: Science-based Education

It is important to understand the complex relationships between changes in human population of all types and the environment. The study of population and environmental linkages has only begun to mature recently as a field of scientific inquiry.

### 1. Clearinghouse

The community of population-environment scholars should create an on-line clearinghouse for distribution of information, expertise, linkages, resources, and educational materials regarding population and the environment. The comprehensive service should build on existing services such as PopPlanet, PLANet and POPLINE and PERN<sup>14</sup>.

### 2. Decisionmakers

Policymakers and other decisionmakers should utilize science-based, multi-sector decisionmaking tools and decision support systems that incorporate information about population-environment linkages.

### 3. Public education

Universities and non-governmental organizations should create partnerships to educate the public about population, the environment and the linkages between them by translating science into understandable information that can be acted upon.

### 4. Elementary and secondary education

Elementary and secondary schools should educate their students about population, the environment and their linkages.

### 5. Graduate education

Universities should establish graduate programs of research and education on population, the environment and their linkages.

### 6. Fellowships

The philanthropic community should create fellowships

- for the media to better understand population, the environment and their linkages.
- for population and environmental scientists to work with Congress.

### 7. Research and training initiative on water

Following a decade when research and training on population and environment interactions has focused on land use, the National Institute of Child Health and Human Development (NICHD) should collaborate with other current and potential funders such as the National Science Foundation to develop and fund a new multi-year, multidisciplinary research and training initiative focused on water. This initiative would help achieve the Millennium Development goal to halve the proportion of people without access to safe drinking water by 2015 and the World Summit on Sustainable Development goal to halve the proportion of people without access to sanitation by 2015.

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<sup>14</sup>PopPlanet contains information on population, health, and the environment: <http://popplanet.org/>.

PLANet promotes international family planning programs, particularly in developing regions: <http://www.familyplanet.org>

POPLINE is a bibliographic reproductive health database: <http://www.popline.org>

PERN (Population-Environment Research Network) promotes scientific exchange among researchers to advance academic research on population and the environment: <http://www.PopulationEnvironmentResearch.org>



# PUBLIC COMMUNICATION

## Strategy for a National Public Communications Campaign on Sustainable Development

Consumption patterns and other human behaviors contribute significantly to sustainability, or the lack thereof. Sustainable consumption does not always mean consuming less, but consuming differently and more efficiently and providing decent living conditions for all within the carrying capacity of the planet. Lack of understanding and caring is a significant impediment to a sustainable and secure future.

**PUBLIC COMMUNICATION, BASED ON SCIENTIFIC UNDERSTANDING**, has great potential for increasing the “sustainability literacy” level of people in the United States and in other nations. Organized public education campaigns can be undertaken on a variety of scales and levels. The following recommendations are directed toward groups pursuing public communication strategies on sustainability.

### 1. Framework

Define a framework and a process to create a clear, inspiring notion of sustainable development.

- Put a marketing plan in place.
- Get participation from the right organizations to provide the expertise and support.
- Use existing multi-media outlets to get the message out.
- Design creative venues for communicating the message.
- Create local events that will introduce people to sustainable development and practices.
- Ensure that the work plan is endorsed in and beyond the United States.

### 2. Stakeholder involvement

Encourage and support the design and implementation of a national movement for sustainable development through a process that considers the full array (diversity) of stakeholders, in particular with local actions encompassing the ten groups of the World Summit on Sustainable Development (WSSD):

- national government;
- local authorities;
- labor and farmers;
- women;

- youth;
- indigenous peoples;
- nongovernmental organizations;
- science, education, and technology;
- workers and trade; and
- business.

### 3. Marketing strategy

Design and implement a comprehensive marketing strategy that includes the following elements:

- A marketing campaign in the short-term that communicates things people can do to be sustainable on an individual basis and current public policies people can support that address sustainable development (e.g. AIDS in Africa).
- A positive message that corporations will embrace and that will engage the public listener.
- Marketing strategies similar to those used by the business world.
- Links between sustainable development needs and economic stability.
- Celebrities who act as spokespeople for sustainable development.

## PUBLIC COMMUNICATION

### Strategy for a National Public Communications Campaign on Sustainable Development (continued)

#### 4. Characteristics of the sustainability message

The specific message of sustainability should possess certain characteristics that are determined by or include the following:

- Conduct audience research on how to develop the message. For example, will making it a moral issue turn it into a political issue?
- Keep the “how” and “why” tied together; i.e. when informing people of how they can take action, also educate them about why it has value.
- The message has to connect to people’s deeply held ethical values.
- Understand how public opinion is formed in contrast to the understanding and knowledge of experts in the field.
- Apply the message locally.
- Make it personal.
- Link sustainable development directly to economic stability and security.
- The message should be positive and dynamic, not dull.
- Identify specific case studies of sustainable development that demonstrate the fallacy of myths and the benefits of enacting sustainability.

#### 5. Target multiple audiences

Tailor the primary message to multiple audiences.

- Target youth as one of the major consumer groups world-wide. Conduct focus groups of young people to understand how to make the message popular.
- Create an American Coalition for Sustainability
- Develop a market for those who want to practice sustainability and don’t know how, as well as those who do not have the desire.
- Develop messages that resonate with baby boomers, such as messages that tie sustainability concepts to economic stability.
- Develop messages that resonate with business.

#### 6. Education programs for professionals and youth

- Create a mid-career educational program for communicating sustainable development.
- Create study and work abroad programs where youth collaborate on sustainable development programs.

#### 7. Universal language

Take into account other peoples’ perceptions, especially the perceptions of people outside the U.S., to create universal language.

# SUSTAINABILITY-SECURITY CURRICULA

## Developing Curricula to Integrate Sustainability and Security

The linkages among issues such as population, environmental change and security are increasingly at the center of key foreign policy challenges and scientific debates. Policymakers, practitioners, and scholars in the United States and abroad are struggling to address the interconnections, which are multiple and diverse.

**TAKEN TOGETHER, SUSTAINABILITY AND SECURITY** issues present a formidable and complex set of challenges for policy, science, and scholarship in the 21st century. Sustainability and security efforts are commonly segregated across university departments, government agencies, and nongovernmental organizations. To begin to break down these divisions and foster collaboration and synergies, one must realize that sustainability and security are two sides of the same coin.

### **1. Sustainability education**

- Sustainability education must incorporate security issues.
- Sustainability education should be seen as a value-added course of study, complimentary to the pursuit of traditional degrees.
- Sustainability education at the high school level and beyond should include a science-based understanding of environmental, social and economic systems.
- Sustainability education at the college level should include coursework, case studies and experiential (project) involvement and be designed to meet the needs of employers and markets.

### **2. State education departments**

State departments of education should develop curricula, guidelines and standards requirements for sustainability education that are experiential, science-based and develop analytic and synthesis skills at appropriate stages on the educational pathway.

### **3. Colleges and universities**

Colleges and universities should include sustainability education as an integral part of their general education requirements.

### **4. Electronic clearinghouse**

There should be a national web-based resource for life-long sustainability education, including case studies of what works.

# SUSTAINABLE PRACTICES

## Moving from Communities of Learning to Communities of Practice

People today, at all levels and in all sectors, have significant access to a variety of educational opportunities about sustainability. A significant amount of data is available about the environmental, social and economic impacts of humankind around the globe. The challenge lies in how we transform these data into meaningful knowledge that can be applied to our nation, our businesses, our communities and our everyday lives. How do we metabolize this knowledge in a way that creates the deep-rooted values required to build the necessary long-term leadership needed for widespread and lasting sustainable practices?

### 1. Moving from commitment to action

All people need to translate personal commitment to diverse action, including corporate action.

### 2. Uncertainty

- Leaders at all levels need to understand that what is unknown is as important as what is known .
- Given that uncertainty is a fundamental condition, the scientific/educational community needs to focus significant effort on communicating about uncertainty to decisionmakers and other citizens.

### 3. Higher education

- Educators should develop higher education programs that emphasize interdisciplinary content and thinking.
- The education system and the media need to shift their focus to emphasize motives other than profit.

### 4. Identification of best practices

- Scientists and engineers should study the best practices of societies that function sustainably.
- Researchers should develop and agencies should fund long-term studies of sustainable practices in order to design replicable transformative experiences.

### 5. Communication

People in all sectors need to widen their perspectives and develop a common language for talking about sustainability.

### 6. Ecological design

Standards for construction of new facilities and renovation of old ones should incorporate the principles of ecological design.

### 7. Sustainable Development Education Network

A Sustainable Development Education Network is needed to work with communities to develop and present success stories that can become well-known examples of sustainability.

### 8. Sustainable sister cities

A national “sustainable sister cities” program that pairs urban and rural cities in sustainability initiatives is needed. A Sustainable Development Education Network could catalyze this.

# TEACHER PROFESSIONAL DEVELOPMENT

## The Link to Success (and Change) in Education: Transforming Professional Development with Teachers

Support for the preparation and ongoing development of educators throughout the United States should involve higher education, non-governmental organizations, community partners, governments at all levels, corporations, school systems, teachers, and students. Partnerships among these groups can make environmental and sustainability education an effective tool to increase student test scores, involve members of the community, and help students understand the implications on the future of the decisions and actions they make today.

### 1. Overarching recommendation

The federal government should provide support for a seamless continuum of professional development from aspiring educators to master practitioners in sustainability and environmental education through the following:

#### 2. New teachers

- Teachers should be educated with the same care and attention with which children are educated.
- Colleges and universities should revisit and revamp the preparation of new educators in content and professional performance.
- College and university teacher preparation programs should
  - adopt sustainability principles;
  - include more content training in specific topical areas; and
  - provide ongoing support to their graduates as they embark on their teaching careers.
- New educators should have experience in research and in the application of science, civics, environment and sustainability before they get to the classroom.
- New educators should be mentored and coached by more experienced teachers as they begin and continue their teaching careers.
- Ongoing professional development should be provided for new educators in assessment, content, teaching methods, and school leadership, continuing throughout their professional careers.

### 3. Continuing professional development

- Provide multiple opportunities for ongoing and sustained professional development that results in “no teacher left behind.”
- All states should require ongoing professional development for teachers, including interface with university faculty and researchers who are skilled in working with experienced teachers.
- Graduate credit and paid leave should be part of ongoing professional development.
- Teachers should receive higher compensation and increased classroom support based on self-initiation of professional development and working in particularly challenging school systems.
- All educators should have access to exemplary materials and resources including funding for off-site programs.
- Teachers should be provided with working examples of curricula that have the essential learnings of sustainability education embedded within them.

## TEACHER PROFESSIONAL DEVELOPMENT

### The Link to Success (and Change) in Education: Transforming Professional Development with Teachers (continued)

#### 4. Resources

- Communities must aid teachers, schools and districts in providing the best experiences and instruction for their students and creating safe learning environments that improve the performance and behavior of students. Support can be provided in a variety of ways, including cash, materials, tools, skills, mentoring, and other resources.
- For urban educators in particular, funding should be available to use the environment as an integrated context for student instruction.
- Federal and state departments of education should support the development and dissemination of high quality materials to all districts, including those with the most need and the most to gain from alternative, but effective, methods of instruction.
- Policymakers and decisionmakers need to be educated about the issues facing education professionals, and should support current exemplary efforts to improve the education systems in their areas and nationwide.

#### 5. Coalition

A coalition for educational support and professionalism would enhance the work of organizations with similar goals looking at different aspects of education.

# UNDERGRADUATE EDUCATION

## Transforming Undergraduate Education for Environmental Sustainability

The undergraduate years are characterized by a maturation of students' worldview as well as a crystallization of personal learning habits. Students acquire knowledge in the context of their evolving personal values. It is important that students use what they learn in their education to challenge their values and their role as citizens.

**COLLEGES AND UNIVERSITIES CAN DEVELOP A SUPPORTIVE INSTITUTIONAL** environment in which undergraduate students can form life habits of environmental awareness and sustainability thinking. It is a responsibility for colleges and universities to reach all students, not only those majoring in natural and social science fields, with a rich environment for integrating sustainability into their personal and professional lives.

### 1. Learning

Academic accreditation organizations, professional societies, university presidents and administrators, higher education organizations, employers, trustees, alumni and funders of education and research should act to advance the following learning outcomes as part of a good liberal arts or pre-professional education:

- Everyone engaged in the educational system should understand the four dimensions of sustainability—health, social, economic and ecological.
- Colleges and universities should model sustainability as a fully integrated community by connecting learning to research, operations, facilities, purchasing and collaborations with local and regional communities.
- All disciplines and majors should integrate sustainability, environmental, social, and science literacy, social change skills and understanding of values into their curriculum.
- Systems thinking should be integrated into the curriculum for all majors.
- Environmental, economic and social “footprints” of students and the college or university should be visible to all students, and students should understand how to reduce any negative impact.
- Interdisciplinary learning should be as strong a part of learning as disciplinary learning, with the same lateral rigor across the disciplines as vertical rigor within the disciplines.

- Educators should have the means to connect different scholarly disciplines and to deal with conflicts among disciplines.
- Students should understand the assumptions of all learning disciplines so they will understand the history of the discipline and can consider whether the assumptions are still appropriate.
- Students should understand that humans are an integral part of nature and should recognize the interdependence of all human and natural systems.
- An integral part of the learning experience for all students should be experiential, collaborative learning on campus, with local communities, and in other parts of the world.

### 2. Faculty development & rewards

- College and university administrations, accreditation organizations, professional societies, trustees and funders of education and research should:
- Help faculty members make sustainability an integral part of their research and education, through formal and informal initiatives and permanent programs for faculty development.
- Change tenure and promotion criteria to foster interdisciplinary teaching and research, involvement in public policy, and public education.

## UNDERGRADUATE EDUCATION

### Transforming Undergraduate Education for Environmental Sustainability (continued)

#### 3. Educational resources

Authors and publishers should make sustainability issues a part of mainstream textbooks and educational resources.

#### 4. Research and assessment

The National Science Foundation (NSF), Department of Education and foundations should support research on and assessment of the impact and effectiveness of sustainability education, research and operations in higher education.

#### 5. Institutional change

Employers, education and research funders, alumni, professional associations, accreditation organizations, and college and university leaders should:

- Come together to discuss ways to make sustainability a foundation of learning and practice.
- Create incentives or demand for higher education to make sustainability a priority.
- Make sustainability a part of the mission statement of higher education institutions.
- Establish and provide staff for university-wide committees to advance sustainability.

#### 6. Employment

Professional societies, higher education administrators, and employers should:

- Inform students about employment opportunities in sustainability learning and practice.
- Change employment classifications in professional associations and higher education to include employment and professional activities related to sustainability.



# BREAKOUT SESSION CHAIRS, FACILITATORS, AND PRESENTERS

## BUSINESS EDUCATION

### Session Chair

**Rick Bunch**, Senior Associate, Sustainable Enterprise Program, World Resources Institute

## COMMUNITY EDUCATION

### Session Chair

**Elaine Andrews**, Executive Director, North American Association for Environmental Education (NAAEE)

## CORPORATE LEADERSHIP

### Session Chairs

- **Sara Ethier**, Director of Environmental Operations, 3M
- **Kim Lamphier**, Program Manager, Friends of the Potomac

### Presenters

- **Michael J. Besly**, Senior Associate, Environmental and Sustainability Services Group at PriceWaterhouseCoopers LLP (PwC)
- **Kats Fisher Maroney**, Consultant, Ecos Corporation

## DIVERSITY

### Session Chairs

- **Jeff Cook**, Chief Executive Officer, Environmental Careers Organization
- **Dan Durett**, Director, Minority Programs, National Council for Science and the Environment

### Presenters

- **Kristie King**, Diversity Manager, Environmental Careers Organization
- **Annemarie Versfeld**, Principal, Versfeld & Nkosi, Johannesburg, South Africa

## EDUCATIONAL RESEARCH

### Session Chair

**Rosalyn McKeown**, University of Tennessee and NSF Advisory Committee on Environmental Research and Education

### Presenters

- **Joe Heimlich**, Assistant Professor, School of Natural Resources, Ohio State University
- **Charles Hopkins**, Chair, UNITWIN/UNESCO Teacher Education Network, York University, Ottawa, Canada
- **William Scott**, Director, Centre for Research in Education and the Environment, University of Bath, England, U.K.

## ENVIRONMENTAL MAJORS

### Session Chairs

- **Molly Anderson**, Director, Tufts Institute of the Environment, Tufts University, and Member, Curriculum Committee, Council of Environmental Deans and Directors (CEDD)
- **James Howard**, Dean, College of Natural Resources and Sciences, Humboldt State University, and Chair, Curriculum Committee, Council of Environmental Deans and Directors (CEDD)

### Facilitator

**Juge Gregg**, Attorney at Law, Perkins Coie LLP

### Respondents

- **Kristy Manning**, Vice President for Programs, Island Press
- **Gerald Stokes**, Director, Joint Global Change Research Institute, Battelle Pacific Northwest Laboratory, University of Maryland

## ENVIRONMENTAL SECURITY

### Session Chairs

- **Douglas Causey**, Senior Biologist, Museum of Comparative Vertebrate Zoology, Harvard University
- **Kheryn Klubnikin**, Ecologist, USDA Forest Service Research & Development, Fish & Wildlife Group, and Environment Chair, Society for International Development, Washington, D.C. Chapter

## GEOGRAPHIC LEARNING

### Session Chairs

- **Greg Crosby**, National Program Leader, Sustainable Development/Environmental Education, USDA/CSREES
- **Doug Richardson**, Executive Director, Association of American Geographers
- **Joshua Stearns**, Policy Analyst, Office of Education and Sustainable Development, NOAA

### Facilitator

**Chris Bernabo**, Director, National Commission on Science for Sustainable Forestry, National Council for Science and the Environment

## GREEN CAMPUSES

### Session Chairs

- **Jack Crowley**, Dean, College of Environment and Design, University of Georgia
- **Harold Glasser**, Assistant Professor, Department of Environmental Studies, Western Michigan University
- **David Orr**, Director, Environmental Studies, Oberlin College

## INTERNATIONAL CHALLENGES

### Session Chairs

- **Wynn Calder**, Associate Director, University Leaders for a Sustainable Future
- **Rick Clugston**, Executive Director, University Leaders for a Sustainable Future

### Presenters

- **Peter Blaze Corcoran**, Professor, College of Arts and Sciences, Florida Gulf Coast University
- **Sidney Draggan**, Senior Science and Policy Advisor, U.S. Environmental Protection Agency
- **Walter Leal Filho**, Professor, Technical University of Hamburg, Hamburg, Germany

## K-12 CONTENT

### Session Chairs

- **Jaimie Cloud**, President, The Sustainability Education Center
- **Jack Byrne**, Co-Director, Center for a Sustainable Future

### Presenter

**Jack Padalino**, President, The Paul F-Brandwein Institute

## K-12 IMPLEMENTATION

### Session Chair

**Mary Miller Smith**, Director of Field Support, National Audubon Society

### Presenters

- **Tamar Chotzen**, Vice President, Centers and Education, National Audubon Society
- **Jim Stofan**, Senior Vice President for Education Programs, National Wildlife Federation
- **Trudi Volk**, Professor, Southern Illinois University at Carbondale, and Executive Director, The Center for Instruction, Staff Development, and Evaluation

## LARGE SCALE CONSERVATION

### Session Chair

**Judy Braus**, Director of Education, World Wildlife Fund (WWF)

### Presenters

- **Janet Ady**, Chief of Education, U.S. Fish and Wildlife Service
- **Steve Gough**, Professor, University of Bath, England, U.K.

## NATURAL HISTORY

### Session Chairs

- **Patty Gowaty**, Professor, Department of Biology, University of Georgia
- **Mitch Thomashow**, Director of the Graduate Program in Environmental Studies, Antioch New England Graduate School

## PLANETARY HEALTH

### Session Chair

**Andrew Brown**, Associate Dean, University of Texas School of Public Health, Houston

### Presenters

- **R. Palmer Beasley**, Dean, The University of Texas School of Public Health, and Chair of the Association of Schools of Public Health (ASPH)
- **Roger Bulger**, President, Association of Academic Health Science Centers
- **M. David Low**, Director, Center for Society and Population Health, University of Texas School of Public Health, Houston

## POPULATION-ENVIRONMENT

### Session Chairs

- **V. Jeffery Evans**, Director of Intergenerational Research, Center for Population Research, National Institute for Child Health and Human Development, National Institutes of Health
- **Vivien Joy Ponniah**, United Nations Population Fund (UNFPA)
- **Peter Saundry**, Executive Director, National Council for Science and the Environment

## PUBLIC COMMUNICATION

### Session Chairs

- **Isabel Castillo**, Sol-Manik, Inc.
- **Warren Flint**, Principal, 5 Es Unlimited
- **Bill Godfrey**, President, Environic Foundation International

### Presenters

- **Erica Anstey**, Public Education and Media Coordinator, Co-op America
- **Carol Rosen**, World Resources Report Program Director, World Resources Institute

### Panelists

- **Jane Elder**, Executive Director, The Biodiversity Project
- **Tony Pigott**, President and CEO, J. Walter Thompson Group Canada
- **Jan Pronk**, Special Envoy of the Secretary General of the United Nations on Sustainable Development

## SUSTAINABILITY-SECURITY CURRICULA

### Session Chairs

- **Geoff Dabelko**, Director, Environmental Change and Security Project, Woodrow Wilson Center for Scholars
- **Bill Godfrey**, President, Environic Foundation International

## SUSTAINABLE PRACTICES

### Session Chair

**Keith Wheeler**, Executive Director, Center for a Sustainable Future, and North American Regional Chair for IUCN's Commission on Education and Communication

### Presenters

- **Megan Camp**, Vice President, Shelburne Farms
- **Terry Cullum**, Director, Environment and Sustainability, General Motors Corporation
- **Bradley Smith**, Dean, Huxley College of the Environment, Western Washington University

### Facilitators

- **Steve Cochran**, Executive Director, International Centre for Leadership Results
- **Roan Conrad**, Director, Sustainable Development, NOAA, US Department of Commerce

## TEACHER PROFESSIONAL DEVELOPMENT

### Session Chair

**Chris Chopyak-Minor**, Vice President of Development, Earth Force

### Presenters

- **Chris Bates**, Director, Regulatory and Legislative Interface, Environmental Services Group, General Motors
- **Phyllis Buchanan**, Manager, Office of Education, DuPont
- **Brooke Carson**, Director of Teacher Training, The Keystone Center
- **Vince Meldrum**, Vice President of Programs, Earth Force

## UNDERGRADUATE EDUCATION

Transforming Undergraduate Education for Environmental Sustainability

### Session Chair

**Elaine Hoagland**, Executive Director, Council on Undergraduate Research

### Presenters

- **Anthony D. Cortese**, President, Second Nature, Inc.
- **Debra Rowe**, Senior Fellow, University Leaders for a Sustainable Future



# CHAPTER 3: CONFERENCE SPEECHES, AWARDS, AND ACTIVITIES

summary of conference

conference program

KEYNOTE ADDRESS: ENVIRONMENT, RIGHTS AND SECURITY

Jonathan Lash, President, World Resources Institute

PLENARY LECTURE A CALL FOR SYSTEMIC CHANGE

Ray Anderson, Chairman, Interface Flooring Systems, Inc.

NCSE LIFETIME ACHIEVEMENT AWARD

Presented to Honorable Gaylord Nelson

NCSE CONGRESSIONAL LEADERSHIP AWARD

Presented to Congressman Vernon Ehlers

# SUMMARY OF CONFERENCE

**MORE THAN 800 SCIENTISTS**, educators, managers, and policymakers from the United States and abroad gathered to consider the role of education in sustainability and human security at the third National Conference on Science, Policy and the Environment, *Education for a Sustainable and Secure Future*. NCSE thanks the conference cosponsors (listed on page 86) and all who took part in the conference (listed on page 78).

## PARTICIPANTS

All aspects of education were represented by the attendees, who included university professors, high school and college students, teachers, administrators, and other educators. Federal agencies were strongly represented, as were state and local government, business, and non-profit organizations. The diverse array of participants came from nearly every disciplinary background; their common denominator was a desire to transcend disciplinary boundaries for a complete understanding of human-environment interactions.

## PLENARY LECTURES

Jonathan Lash, President of the World Resources Institute, opened the conference with his keynote address, **Environment, Rights, and Security**. Lash argued, “Military strength and homeland security are not enough to make the world secure. I want to make a case for fighting poverty, protecting the environment, and in particular protecting people’s rights as the path to human security, and the foundation, in the long term, for global security.” The full text of Mr. Lash’s speech is available on page 56 of this report.

Ray Anderson, Founder and Chairman of Interface Flooring Systems and leader of a revolution for sustainable industrial practices, opened the second day of the confer-

ence with a *Call for Systemic Change*. He described how Paul Hawken’s book *The Ecology of Commerce* (Harper 1993) changed the actions of himself and his company. “It convicted me on the spot, not only as a plunderer of Earth, but also as part of an industrial system that is destroying Earth’s biosphere, the source and nurturer of all life,” he said. “I was struck to the core by Hawken’s central point, that only business and industry, the major culprit, is also large enough, powerful enough, pervasive enough, wealthy enough, to lead humankind away from the abyss toward which we are plunging.” He discussed the ensuing efforts of Interface to reduce its ecological footprint by using only natural and renewable resources, and implementing less wasteful manufacturing processes.

Mr. Anderson then laid out a challenge to academia: “The tragedy is that our graduates, steeped in traditional technical education, liberal arts, economics, and the humanities, are themselves too often emerging from our universities blind to reality—oblivious to the realities of a finite Earth... If your job is to dispel ignorance, then put ecological and social ignorance at the top of your priorities. Let your research help define the path society should choose for survival of *Homo sapiens*, not its extinction, and the preservation of those other 30 million species.” The full text of Mr. Anderson’s speech is on page 61 of this report.

## THIRD JOHN H. CHAFEE MEMORIAL LECTURE ON SCIENCE AND THE ENVIRONMENT

Dr. Rita Colwell, Director of the National Science Foundation, delivered the third John H. Chafee Memorial Lecture on Science and the Environment entitled *Obstinate Issues, Sophisticated Solutions: Environmental Science and Education for a New Age*. According to Dr. Colwell, “A new

age of scientific exploration...is dawning. It holds great potential for transforming our understanding of environmental processes and providing new tools to address environmental problems. The integration of environmental research and education, at all levels, and collaboration across diverse communities will be vital to designing sophisticated and effective solutions that will move us toward an environmentally sound future.”

Dr. Colwell closed by emphasizing the importance of education: “Learning is humanity’s quintessential contribution to the great unfolding story of life’s evolution on earth... We have the knowledge, the tools, in hand, if not today, then soon in the future to help us along the way. But, our journey will falter, even fail if we do not seriously take up the challenge of environmental education. Our collective concern and responsibility is to teach a new generation of citizens to understand our interdependence with all life on earth—to recognize the evolutionary processes through which we arrived on the scene, to preserve the ecological balances that sustain us, and to see the vulnerability of the planet and our co-habitants on it as our vulnerability.”

Dr. Colwell’s address will be published in a separate report produced by NCSE. The text and a webcast of Dr. Colwell’s lecture is available on the conference website.

#### **NCSE LIFETIME ACHIEVEMENT AWARD**

Former Senator and Wisconsin Governor Gaylord Nelson, founder of Earth Day and environmental champion for more than 50 years, received the NCSE Lifetime Achievement Award. The award was presented by Denis Hayes, President of the Bullitt Foundation and coordinator of the first Earth Day. In his acceptance speech, Nelson spoke optimistically of students’ increasing knowledge and understanding of environmental issues. Referring to the talks he has given every Earth Day for the past three decades, he said that he notices “grade-schoolers are asking more sophisticated questions [about the environment] than college seniors were in the 1970s.” A biographical sketch of Nelson’s distinguished career is found on page 69.

#### **ROUNDTABLE DISCUSSIONS ON SUSTAINABILITY**

The conference featured roundtable discussions ranging in topic from public communication to environmental and health protection. Ray Suarez from the NewsHour moderated a panel of government, science, and education leaders who responded to Mr. Lash’s lecture in a spirited discussion regarding sustainability and education. Tom Lovejoy, President of the H. John Heinz III Center for Science, Economics and the Environment, led education leaders and policymakers in discussion of the recommendations for sustainability education that were developed at the conference. Media and communications experts discussed how to present sustainability concepts to the public in a panel moderated by Jan Pronk, Special Envoy of the UN Secretary General on Sustainable Development.

#### **BREAKOUT SESSIONS AND RECOMMENDATIONS**

After the first set of morning events, conference participants met in 21 lively discussion sessions on topics spanning the educational enterprise from elementary and secondary education to college and professional school, as well as public, corporate and community education. In each case, session chairs and invited discussants began conversations that engaged each conference participant in developing recommendations for advancing education for sustainability and security within their topical area. The recommendations start on page 17 and a list of session chairs and discussants is found on page 47.

#### **CONFERENCE EXHIBITION**

Other related groups joined NCSE at the conference in spreading research and knowledge across the environmental spectrum. More than 30 government agencies, educational institutions, not-for-profit organizations, and businesses demonstrated their latest innovations at the conference exhibition, *Education: Programs and Products*. A list of exhibitors can be found on page 85.

#### **Transcripts, videos, and audiotapes**

Video and audio tapes of plenary lectures and roundtable discussions may be ordered from the conference website. The site also contains transcripts of key presentations and a link to the webcast of Dr. Colwell’s Chafee Memorial Lecture.

Visit the conference website at <http://www.NCSEonline.org/EFS>

For additional information, e-mail [Conference@NCSEonline.org](mailto:Conference@NCSEonline.org).

# CONFERENCE PROGRAM

## THURSDAY, JANUARY 30, 2003

- 8:00 a.m. **ROLLING RAINFOREST EXHIBIT**  
Sponsored by the Discovery Creek Children's Museum of Washington
- 9:00 a.m. **WELCOME**  
Dr. Stephen Hubbell, Chair, National Council for Science and the Environment
- 9:15 a.m. **KEYNOTE ADDRESS**  
*Environment, Rights, and Security*  
Jonathan Lash, President, World Resources Institute
- 10:30 a.m. **ROUNDTABLE DISCUSSION**  
Ray Suarez (Moderator), The NewsHour  
Dr. Dee T. Allsop, CEO, Wirthlin Worldwide  
Dr. Charles G. Groat, Director, U.S. Geological Survey  
Denis Hayes, President, The Bullitt Foundation  
Timothy R. E. Keeney, Deputy Assistant Secretary of Commerce for Oceans and Atmosphere, National Oceanic and Atmospheric Administration  
Jan Pronk, Special Envoy of the Secretary General of the United Nations on Sustainable Development; former Minister for Environment of The Netherlands  
Dr. David Orr, Professor and Chair, Environmental Studies, Oberlin College  
Lynn Scarlett, Assistant Secretary for Policy, Management, and Budget, U.S. Department of the Interior

- 12:00 p.m. **CONFERENCE EXHIBITION**  
*Education: Programs and Products*
- 1:30 p.m. **BREAKOUT SESSIONS**  
*To develop a national agenda for education for a sustainable and secure future and recommendations for the UN Decade of Education for Sustainable Development*
- 5:30 p.m. **THIRD JOHN H. CHAFEE MEMORIAL LECTURE ON SCIENCE AND THE ENVIRONMENT**  
*Obstinate Issues, Sophisticated Solutions: Environmental Science and Education for a New Age*  
Dr. Rita R. Colwell, Director, National Science Foundation  
Welcome by Ambassador Richard Benedick, President, National Council for Science and the Environment  
Remarks by Georgia Chafee Nassikas  
Introduction by Donald Langenberg, Vice Chairman, National Council for Science and the Environment



## FRIDAY, JANUARY 31, 2003

- 8:00 a.m. **WORLD PREMIER FILM SCREENING**  
*Journey to Planet Earth: On the Brink*—First episode of the upcoming PBS series  
Additional screenings at 12:00p.m. and 3:45p.m.
- 8:00 a.m. **CONFERENCE EXHIBITION**  
Education: Programs and Products
- 9:00 a.m. **PLENARY LECTURE**  
*A Call for Systemic Change*  
**Ray Anderson**, Chairman, Interface Flooring Systems, Inc.
- 10:00 a.m. **BREAKOUT SESSION SUMMARY AND RESPONSE PANEL**  
**Dr. Thomas E. Lovejoy** (Moderator), President, The H. John Heinz III Center for Science, Economics and the Environment  
**Dr. Bruce Alberts**, President, National Academy of Sciences  
**Richard C. Bartlett**, Vice Chairman, Mary Kay, Inc.  
**Dr. Rodger Bybee**, Executive Director, Biological Sciences Curriculum Study  
**Marietta English**, President, Baltimore Teachers Union  
**Dr. Paul Gilman**, Assistant Administrator for Research and Development and Science Advisor, U.S. Environmental Protection Agency  
**Nora Howley**, Project Director, Council of Chief State School Officers  
**Dr. Shirley Malcom**, Director, Education and Human Resources, American Association for the Advancement of Science  
**Dr. Tony Michaels**, Director, Wrigley Institute of Environmental Studies, University of Southern California; President, Council of Environmental Deans and Directors  
**Jan Pronk**, Special Envoy of the Secretary General of the United Nations on Sustainable Development; former Minister for Environment of The Netherlands  
**Dr. Judith Ramaley**, Assistant Director, Education and Human Resources, National Science Foundation
- 1:30 p.m. **NCSE LIFETIME ACHIEVEMENT AWARD**  
**Honorable Gaylord Nelson**, U.S. Senator and Wisconsin Governor (retired); Earth Day Founder; Counselor, The Wilderness Society  
Presented by **Denis Hayes**, President, The Bullitt Foundation; Coordinator of the first Earth Day
- 2:00 p.m. **CLOSING PLENARY SESSION**  
*How to communicate to the public about the environment, sustainability and a secure future*  
**Jan Pronk** (Moderator), Special Envoy of the Secretary General of the United Nations on Sustainable Development; former Minister for Environment of The Netherlands  
**Kevin Coyle**, President, National Environmental Education and Training Foundation  
**Tom Donlan**, Editorial Page Editor, Barron's  
**Jane Elder**, Executive Director, The Biodiversity Project  
**Julissa Marengo**, General Sales Manager, Telemundo  
**Tony Pigott**, Global Director, Social Marketing, and President and CEO, J. Walter Thompson Canada  
**William A. Smith**, Executive Vice President, Academy for Educational Development  
**Phil Sparks**, Co-Director, Communications Consortium Media Center  
**Tom Toles**, Editorial Cartoonist, The Washington Post

# KEYNOTE ADDRESS: ENVIRONMENT, RIGHTS, AND SECURITY

**Jonathan Lash**  
**President, World Resources Institute**  
**January 30, 2003**



**IT IS WONDERFUL TO SEE SO MANY FRIENDS** and colleagues here this morning, and I am honored to see several of my heroes seated in the front row.

Before going any further, let me correct Karim's fulsome introduction. I am a lapsed lawyer, a recovering bureaucrat, and a recidivist in the policy field. An advocate by instinct and inclination, I have never had as much fun as I do leading WRI—this very credible global environmental think tank that goes beyond research to create practical ways to protect the earth and improve people's lives.

We work with several hundred partners in over 50 countries, ranging from courageous local groups campaigning against illegal logging in Cameroon to multi-national corporations like DuPont and IBM that are working to limit greenhouse gas emissions.

I want to talk to you today about security, environment, and human rights, and how they are, or can be connected.

Since 9/11 the United States has devoted enormous resources and intense attention to identifying, forestalling, and, ultimately capturing or destroying those bent on harming us or our friends. Generally that is what "security" means in the current debate. Now rising tension over war in Iraq and awareness that a U.S. led attack on Iraq will almost certainly provoke increased efforts by terrorists to injure Americans, and American interests, have heightened concerns about short term security.

Those concerns are real and we are compelled to act to confront them. But military strength and homeland security are not enough to make the world secure. I want to make a case for fighting poverty, protecting the environment, and in particular protecting people's rights as the path to human security, and the foundation, in the long term, for global security.

Neither violence nor hatred is a pathology only of the poor, nor does violence flare only in the presence of poverty, but poverty is volatile when compounded with misery, powerlessness, and injustice. Although the terrorists we know most about were not recruited from among the poor, they seem bent on provoking a war in which the poor would be soldiers. We cannot create security only by striking at the flint; we must deal with the tinder.

What if we capture the leaders of terrorist groups, seize their resources, disrupt their networks, and deter their state sponsors, but act with narrow focus, treating terror as a crime without a cause that we can address, will our world be secure?

The squalid slums of the sprawling cities in the poorest parts of the world are growing explosively, expanding by a million people a week—a million people a week. Why?

Three-fourths of the world's agricultural lands are degraded, and the cities are filling with people driven from rural areas by expanding population and failing lands.

In the Indus basin of Pakistan some 40,000 ha goes out of production every year due to salinisation and sodification.

There are about a billion teenagers in the world, most of them poor, jobless and struggling for shreds of hope. Within a decade or so, if trends continue, there will be 27 cities in the developing world that are bigger than New York. If they are full of jobless young men with nowhere to turn, they will be tinderboxes of anger and despair.

Close to half of all jobs worldwide depend on fisheries, forests, and agriculture. In one-fourth of the world's nations natural resources directly produce more income than industry. The condition and management of those resources affects people's lives directly.

Many of the most insecure and poorest regions of the world are also the least democratic. People are not only poor, they are voiceless. Dependent directly on natural resources they have no say in how those resources are used, but suffer the consequences when the decisions are corrupt and the use is destructive.

The notion that security, stability, and sustainability are linked is by no means novel. For millennia refugees have been driven from the land by population growth and the collapse of natural systems. Nations have fought for access to scarce natural resources.

What is different now is our opportunity to achieve security by improving lives and protecting the future. The question is whether we will use these capabilities as an alternative weapon in our war on terror.

Imagine if we determined not only to root out terrorism, but also to deprive it of soil in which to grow. With only modest increases in aid, we could enable vast improvements in education, health, agriculture, and microcredit to launch small businesses. We could support private sector investments to bring electricity and telecommunications to rural areas. We could assist in the dispersion of practical technologies to use water many times more efficiently.

We could support programs to educate and empower women, protect their health, and enable them to plan their families.

We could find a way to join the allies whose help we now seek in confronting terrorism, to combat global climate change, using our immense technological capacity to reduce our use of fossil fuels and diminish our dependence on foreign oil.

We could work to ensure people's rights to information about natural resources and environmental decisions that affect them. We could give people the tools to make better decisions.

This last point—the creation of “environmental democracy” and the vindication of human rights—deserves more attention than it ordinarily gets from environmentalists. It offers a great lever for change—a weapon against corruption and a catalyst to stir action by governments immobilized in the face of the complexity of global problems of sustainability.

Perhaps the place to start in talking about human rights and the environment is the Haida Gwaii—a remarkable archipelago 100 mi off the coast of British Columbia. It is a place of waters rich with life, towering cedar trees, and very stormy weather.

The southern third of the archipelago is a park accessible only by water where my wife and I spent 10 days kayaking last summer. It is the only park in the world administered by descendants of its original aboriginal inhabitants. Their history is much like that of other North American native people—victims of disease, domination, relocation, whaling, and logging which stripped large parts of the northern islands.

The park was created a decade ago when remnants of the Haida people said “no more!”, and with the backing of environmentalists won creation of the park.

Was this an issue of human rights? Environment? Of course it was both, and, but for the peaceful outcome, it was typical.

The story of Haida Gwaii fall in a familiar pattern:

- Chico Mendes—Brazilian rubber tapper from Xaipuri in the Amazon—murdered by ranchers for protesting their destruction of the forest his community lived in and from.
- Ken Saro Wiwa—executed—protesting oil pollution and corruption.
- Edwin Bustillos—beaten and threatened, his colleagues killed mysteriously, protesting illegal logging in Mexico's Sierra Madre.
- Yosepha Aloman—elder of the Amungma people in Irian Yaya, tortured, imprisoned in a cell a foot deep in feces, protesting the destruction caused by the Freeport McMoran mine, and rights that were violently suppressed in creating it.

The community of Anniston, Alabama that was victimized by toxic pollution from a Monsanto plant for 30 years after a Monsanto consultant had told them that the plant's discharge was so toxic it killed fish faster than battery acid.

Natural resource destruction almost always means human misery. It is almost always accompanied by abuse of the most basic human rights. The victims are usually poor. The poor are least able to defend their interests, least likely to have or assert property rights, they have least access to technology to protect themselves. When sea level rises and storms worsen due to climate change the Dutch build dikes, American vacation home owners demand government subsidized insurance, and Bengalis drown or become refugees.

Chico Mendes, Freeport McMoran, Anniston, Alabama—these are flagrant cases of environmental destruction that injures people's lives and livelihoods directly, eliminating their source of sustenance and income, wrecking their homes, or threatening their health. In each case, the victims also suffered from corrupt and illegal decisions, and often violent repression of legitimate protest. Indeed, environmental protest and movements for political rights often become intertwined. These are not hard cases. Of course environmental harm that injures people, degrades their land, destroys their livelihood, and steals their hopes for the future violates the victim's rights... almost by definition. What happened in the cases I described was morally wrong, politically antideluvian, and environmentally reprehensible—the trifecta of abuse.

But it is worth turning the analysis around for another look:

If environmental and human rights abuse are often linked, are rights—access to information, opportunity to participate, the right of judicial redress—an effective antidote to environmental destruction?

Well, that's not so hard either, right?

There is the National Environmental Policy Act (NEPA), a superb bundle of procedural rights that has proven to be a killing ground for really bad ideas. Perhaps that is why the Bush Administration is assiduously seeking to weaken NEPA—by requiring the assessment, disclosure, and public discussion of the environmental impact of governmental actions it imposes inconvenient restraints on their efforts to hand over public resources for private use regardless of environmental consequences.

One of the pledges governments signed at Rio, Principle 10 of the Rio Declaration, was a commitment to provide people with information about environmental decisions

affecting them, access to the decision process, and a means of seeking redress if those rights are denied. In the decade after Rio, Principle 10 was not widely implemented. WRI has launched a campaign with partners from around the world to create indicators of progress in providing access, evaluate governments, and drive implementation. In Johannesburg this access initiative won wide support and commitments from dozens of governments and international institutions because it has the potential, as one senior Latin American official said “to change everything.”

The toxic release inventory, and community right to know legislation in the United States which require disclosure of industry's use or release of toxic chemicals have been the most powerful incentive ever enacted to reduce pollution. Information is very powerful.

Some young colleagues of mine have created a space-based “Human Rights Watch” for trees. It is called Global Forest Watch. It uses satellite data linked to on-the-ground information from our NGO partners to track what is going on in the remaining great forests from Siberia to Cameroon. We are using the technology that the military uses to track tanks in the desert to track illegal logging in the jungle.

Even more remarkable as we started doing this work we were approached by major wood using companies who wanted to know how they could use the GFW maps to assure their customers that they don't get their wood from endangered forests. We really felt we'd made progress when the Swedish furniture company IKEA announced in their catalogue that they were using the GFW maps to guide their purchases of wood.

Consumers are connected by information to the impacts of their consumption. As powerful as the globalization of markets has been, the globalization of information may ultimately have the greater impact on our world. We live and travel constantly connected to a global network of information by CNN, cell phones, the endless global swarm of e-mails that swirl in our wake like a pursuit of moths. Information, images, information, and ideas flow frictionlessly around the earth in an increasing torrent overwhelming the significance of borders as barriers and diminishing the capacity of governments to control events.

Information is power. Governments have always sought to control and manage it, applying the harshest penalties for espionage ...for those who steal information. Gutenberg launched revolutionary change, and ultimately the industrial revolution when he invented movable type.

Two of the last three Nobel prizes for economics were given for work that explored the power of information—Amartya Sen who demonstrated that there has never been a famine in a democratic society with a free press, and Joe Stiglitz who showed how the efficiency of markets can be distorted without the free flow of information (even in the absence of fraudulent Enronization).

If information is power, control is shifting incredibly rapidly. 500 mm people are connected to the internet which contains perhaps 25 trillion words. Use is growing fastest in Latin America, China, and India.

It took 46 years for one quarter of Americans to get electricity, 35 years for the same proportion to get the telephone, 16 years for the personal computer, and seven for Internet access.

Then there has been the rise of civil society—there are about 190 nations, 20,000 multi-national corporations, but there are several million NGO's, each needing no more than web access to achieve global reach.

The multilateral agreement on investment, negotiated in secret, was derailed by an ad hoc e-mail firestorm of protest in the course of a few weeks. The land mine ban was driven by a loose internet coalition that rejected the wisdom of diplomats that change would take decades.

We have seen what happened to highly visible global companies who were perceived to have violated social norms of environmental stewardship, or human rights.

It is a simultaneous expansion of access and usability that provide an enormous new opportunity for voice, and to build ad hoc communities of common purpose to amplify voices.

Access to information is a potentially powerful engine to strengthen the rights of the excluded, and strengthening those rights can be a powerful engine for a more sustainable and secure world. But there is a problem with the satisfying symmetry of this view that if fewer rights means more destruction, then more rights must mean greater control, and less destruction. Protection of individual rights doesn't always mean result in more protection. The history of environmental regulation is one of applying coercive measures to restrict individual freedom to harm the environment. Yet not every logger, or miner, or rancher has managed his use of nature's gifts sustainably.

There are some hard things to think about lurking here. Consider the differences between the approach of the human rights advocates and that of most environmental groups:

- Human rights advocates address present harm, environmentalists tend to focus on future risk.
- Human rights advocates are concerned with harm to people, while environmentalists also deal with harm to nature.
- Human rights advocates defend the individual against the tyranny of the majority, environmentalists fight for the common good against narrow individual interests.
- Human rights advocates seek to limit the power of the state, while environmentalists often rely on the regulatory power of the state.

Civil libertarians are, of course, familiar with arguments about the common good—that is John Ashcroft's argument about why security is more important than liberty—and the balancing required. But 21st century environmental issues present the question of rights and responsibilities in ways that we will have to resolve...soon.

Another characteristic of the global era is the emergence of environmental problems that are big, global and irreversible. For example the loss of biodiversity—extinctions have reached perhaps 15 percent. The world's strategy for the protection of biodiversity during the twentieth century was the creation of parks and protected areas—a notable outcome of the century was the designation—on paper at least of something like 10 percent of the dry surface of the earth for protection. We know that is not adequate, and in many cases protection is ineffective, but it is also true that in many places the protections they grant are seen as coming at the expense of people who live there, and must be protected by force of arms...

Or consider global warming.

Climate change is real, it is underway, the emissions that cause it are increasing rapidly, and warming is happening more quickly with more significant consequences than previously anticipated. Arctic Sea ice is rapidly thinning, and glaciers are retreating worldwide. Scientists are also beginning to see biological and ecosystem effects that had been predicted as a consequence of global climate change. Trees are budding a week or two sooner in the spring, birds have been laying eggs earlier, butterflies have moved up mountains and toward cooler polar regions, and vectors of disease—like malarial mosquitoes—have extended their range.

Climate change is the quintessential global environmental issue: emissions from one area of the globe affect the climate everywhere, although not equally. All countries contribute to the problem, although again, not equally. Countries differ in their vulnerability to climate change, and in their capacity to adapt. Low-lying coastal areas, such as those of Bangladesh, and islands, such as those of the Pacific, face the greatest risks from rising sea levels and more severe storms. Industrialized countries are in a better position to protect, or rebuild infrastructure destroyed by storms, to adjust agricultural production to new conditions, or to avoid the spread of epidemics through adequate healthcare provision.

Although every country has emissions of carbon dioxide, most of the emissions come from industrialized countries, and the United States with less than five percent of the world's population is responsible for nearly 30 percent of carbon dioxide emissions. Emissions from U.S. power plants alone exceed the emissions of 146 countries with roughly 75 percent of the world's population. The emissions from India and China combined are 60 percent of U.S. emissions, and the average American is responsible for 20 times the emissions of the average Indian, ten times the average Chinese. Two billion people have no access to electric power, and another two billion have limited access to electric power and motorized transport. Their lives have little impact on warming, but warming will have a significant impact on them.

This raises some interesting questions about justice and rights. Whose rights? Justice for whom?

When an American drives an SUV and causes emissions that will contribute to the sea level rise that will submerge Vanatu is that his right or a human rights abuse?

When our generation makes choices—or more importantly—fails to make choices that create irreversible environmental changes that it is far more difficult for our children to deal with what principle can we articulate for our allocation of rights between current and future generations?

Whose rights should be protected, and how do we persuade our fellow citizens?

I do not believe that sustainability or security can be achieved against people or their interests. To make progress we must embrace the vindication of rights as a strategy for change. The mechanisms we create to deal with global problems must be built on the principle of fairness. We have to create means and incentives to achieve biodiversity conservation by creating sustainable livelihoods.

But in the alliance for human security rights advocates must endorse the notion that rights alone also are not enough because the laws of nature are not negotiable. The campaign for rights will be immeasurably strengthened by association with the great obligation of stewardship that the number and power of our races imposes.

*Thank you.*

# PLENARY LECTURE: A CALL FOR SYSTEMIC CHANGE

Ray Anderson  
Chairman, Interface Flooring Systems, Inc.  
January 31, 2003



**THANK YOU, TONY. WHAT AN HONOR TO BE INTRODUCED BY AN AMERICAN HERO!** Ambassador Benedick, ladies and gentlemen, it is a privilege to speak to this august group. I bring greetings from Atlanta. I know my accent is strange to most of you (and I have a bit of a lisp), so tune your ears while I begin with a story.

It has been going around. If you've heard it, please bear with me. It makes a point. It seems that Sherlock Holmes and Dr. Watson go on a camping trip. Night comes on, and they go to bed. In the middle of the night, Sherlock Holmes wakes up and punched Watson awake. "Watson, what do you see?" Watson looks up and in his inimitable way says, "Meteorologically speaking, I see we're in a high pressure zone. The sky is perfectly clear. Cosmologically speaking, I see an expanding universe with billions and billions of galaxies, each containing billions and billions of stars. Astronomically speaking, I see our own galaxy, the Milky Way, and five first magnitude stars. There is Altair, Arcturus, Deneb, Vega, and Regulus. Astrologically speaking, I see that Mars is in Capricorn and Saturn is in Sagittarius. Chronologically speaking, I deduce from the position of the stars that it's 3:15 a.m. What do you see, Holmes?" Holmes hesitates a moment, collects himself, and then replies, "Watson, you idiot. Someone has stolen our tent." Hang onto that punch line. We'll come back to it.

Perhaps your breakout sessions yesterday obviated everything I intend to say. Perhaps not. Dr. Colwell's remarks last night encouraged me to say it anyway.

I am a Georgia Tech engineering graduate, Class of '56, the Founder, Chairman and, for 28 years, the CEO of Interface, Inc.—a \$billion manufacturer of carpets, textiles, and architectural products for institutional and commercial interiors. I am an industrialist, but I changed my view of the world in the summer of 1994. After 21 years of unwittingly plundering the earth, I read Paul Hawken's book *The Ecology of Commerce* (Harper 1993). It came for me at a propitious moment. Our customers, especially interior designers, had begun to ask, "What's Interface doing for the environment?" So, I had agreed, reluctantly, to speak to a newly assembled environmental task force of Interface people to address this awkward question. Awkward, because I could not get beyond, "We obey the law; we comply."

Hawken's book changed that. It convicted me on the spot, not only as a plunderer of Earth, but also as part of an industrial system that is destroying Earth's biosphere, the source and nurturer of all life. I began to understand, reading Hawken, things I never learned in college: that there is red ink everywhere—that every life support system and every living system that make up the biosphere (where we and the other creatures live), that spherical shell that is 8,000 miles in diameter (the diameter of Earth) and only about 10 miles thick—extending about five miles downward from sea level into the depth of the oceans, and about five miles upward into the troposphere, that spherical shell that contains and nurtures all life—on a basketball-size Earth, tissue paper thin—that every life support system and all the living systems that together comprise the biosphere are stressed and in long-term decline, and the rate of decline is accelerating: Where is the red ink coming from?

Polluted *rivers* and *streams* from municipal, industrial, agricultural, and construction sources.

Polluted and over-fished *oceans*. PCBs accumulating in orcas. Fish stocks collapsing, coral reefs dying. Scuba divers know it's true.

*Lakes* polluted, many dead from acid rain, industrial pollution, and agricultural runoff; *forests*, too, dead and dying from acid rain and atmospheric ozone, originating in our cities, drifting into our rural areas; affecting *crop yields* adversely, too. We don't think about this in our land of abundance, but it is of special importance to China. Increasing pollution from advancing industrialization will determine the balance of whether China can feed itself. A China that cannot feed itself is everyone's problem. Yours, mine, our children's, our grandchildren's, and theirs and theirs.

Disappearing *wetlands*—the beginning of the food chain, that leads to us at the other end.

Devastated *rainforests*, a critical lobe of Earth's lungs; *old growth forests* (haven for bio-diversity) almost gone, mostly clear cut, destroying *habitat for countless species*.

Depleted and polluted *aquifers*. In parts of India and China water tables are falling 10 feet a year.

Spreading *deserts*.

*Farmlands*, denuded of topsoil, increasing in salinity from irrigation, and toxified by pesticides, turning into deserts.

*Range lands*, pushed to the limit of their carrying capacity to feed the livestock which feed us.

*Atmosphere*, polluted by countless toxins, *CO<sub>2</sub>* and other greenhouse gases building up, inexorably to create climate aberrations—*global warming*; the scientific debate about global warming is over; the debate is now political and economic. The science is clear and compelling. The threat is real; 2600 scientists from all over the world agree; a dwindling handful hold out in skeptical disagreement. Another U.N. report recently published says average temperatures could rise 10 degrees Fahrenheit this century. That would be devastating! The precautionary principle dictates: We must act as if global warming is real, the risk from not acting is just too great. The Kyoto protocol were it ratified into treaty, would make only a tiny dent in the total problem. It's only a beginning, and not nearly enough. Many scientists are advising a strategy of adaptation. It's too late to prevent, so adapt to, drastic changes in Earth's climate in the 21st Century, and work now to mitigate the 22nd Century. We have trouble getting serious about a time frame like that, that extends beyond our own lifetimes.

And even the *stratosphere* itself, beyond the troposphere in which *ozone* shields us from deadly u.v. radiation.

All severely stressed by man-made degradation.

I know there are exceptions, and they ought to be celebrated: Maybe the ozone hole is healing. Let's hope the current report is a trend, not a blip. You can now see across the street in Pittsburgh. The Cuyahoga River in Cleveland no longer catches on fire. There are eagles again on the upper reaches of the Mississippi. The Great Lakes have stabilized. In London, there are fish in the Thames at Tower Bridge. (The Minister of the Environment, 40 years ago, took the Parliament down there and made them drink out of it—it didn't take them long to clean it up! It illustrates what "The Power of One" can do.) In many western countries, toxic emissions are down over the last 25 years. British Columbia's old growth is finally being protected. Beach closings are down in New Jersey. (For God's sake!) Well, down is better than up. Clams are back in Puget Sound.

But the salmon are disappearing from the rivers that feed Puget Sound. We need many more victories to celebrate, because the general pattern worldwide is frightening and getting worse. For every positive exception, there are huge deficits on the other side of the ledger: Beijing, Shanghai, Bangkok, Sao Paulo, Mexico City, Cairo, Delhi, the Amazon, the spreading Sahara and Gobi, and on and on, eventually my city, Atlanta, and your city. Some of those places seem far away until we remember, there is



only *one* global biosphere. China's sandstorm today becomes Denver's fallout next week. One result of the stress from human intervention is that *species are disappearing* into extinction at a rate unknown on Earth since the mass extinction of the dinosaurs 65 million years ago. This is not good news for our species, either, because we are fouling our own nest, too. We cannot live without those life support systems anymore than the other species can, though in our denial and arrogance, we may think we can.

And, as if that were not enough, you can add to that list a growing nuclear cleanup that no one knows how to deal with. What language shall we use to instruct people 20,000 years from now how to deal with this legacy of nuclear waste we are leaving them? (What is it? Seventy-seven thousand metric tons and counting, in the U.S. alone.) No language on Earth is 20,000 years old! And to that, add one billion of Earth's people unemployed; and to that add another billion living in starvation conditions; and another billion hanging on by their fingernails. Half of Earth's people, human beings, in serious trouble, subsisting on less than \$2 a day, many on *much* less. Two-thirds of humanity left out by the present economic system, except perhaps to be exploited. Social equity (attention to human capital) like the environment (attention to natural capital), lost in the shuffle, as we focus myopically on financial capital through the lens of a misbegotten economic system. We cannot escape the consequences of that misplaced focus. We witness the ravages of AIDS and we wonder, "What's next?" September 11th gave us one "what's next." Now, we wonder, what's next?

Furthermore, especially for companies like mine, finite, exhaustible, non-renewable resources—natural gas, coal, and oil—Earth's stored natural capital, *capital*, mind you—being gobbled up at an obscene rate, most of it burned for energy and, in the process, converted into carbon dioxide to exacerbate the greenhouse effect. And the beat goes on—*it is a crisis*: the crisis of our times and all time to come. Because it is a funeral march to the grave, if we don't figure out and do what's necessary to reverse the deadly trend.

Back to that task force and that first speech, I was struck to the core by Hawken's central point, that only business and industry, the major culprit, is also large enough, powerful enough, pervasive enough, wealthy enough, to lead humankind away from the abyss toward which we are plunging. It was an epiphanal experience for me, a "spear in the chest", and the resultant speech went way beyond compliance, to put our company on the path toward

sustainability. I myself became a recovering plunderer. At Interface we call this new direction, climbing Mount Sustainability, the point at its peak symbolically representing zero environmental "footprint"—our definition of sustainability for ourselves, to reach a state in which our petro-intensive company (energy and materials) takes nothing from the earth that is not naturally and rapidly renewable, and does no harm to the biosphere: "zero footprint."

We simply asked ourselves in the summer of 1994, "If Hawken is right, who will lead?" Unless somebody does, nobody will. It is axiomatic. I asked, "Why not us?" The people of Interface responded magnificently, taking on this higher corporate purpose as their own. It has added meaning to their lives and, at the same time, engaged our customers, suppliers and communities in countless opportunities to do the right thing for Earth. "Doing well by doing good" has emerged as a viable paradigm, perhaps THE paradigm of true business success that will prevail in the 21st Century. It is a better way to bigger, and more honorable, profits—and beyond profits, to purpose; beyond success to significance.

We are approaching the challenge of Mount Sustainability on seven fronts—the seven faces of the mountain. The entire industrial system, including the educational sector, must climb these same seven faces, if it is to become sustainable; this is our Master Plan:

- *Waste elimination*, emulating nature in our industrial processes, nature where one organism's waste is another's food. This means revolutionary re-design and re-engineering of processes.
- *Benign emissions*, to do no further harm to the biosphere. This means re-shaping inputs to our factories. What comes in will go out—as product, waste, or emissions.
- *Renewable energy*, energy efficiency first, then harnessing sunlight, wind, bio-mass, and hydrogen—to cut the fossil fuel umbilical cord to Earth.
- *Closed-loop material flows*, to cut the material umbilical cord to Earth for virgin materials.
- *Resource-efficient transportation*, to achieve carbon neutrality by eliminating or off-setting greenhouse gas generated in moving people and products from Point A to Point B.
- *Sensitivity hook-up*. This is the cultural shift, the mindset shift, to sensitize and educate everyone—customers, suppliers, employees, communities—to the plight of

Earth, and to inspire environmentally responsible actions. I suggest that this is, perhaps, education's greatest challenge—your greatest challenge—overcoming and shedding a mind-set that embraces the status quo. This is a good place to invoke the words of Frank Outlaw: “Watch your thoughts; they become words. Watch your words; they become actions. Watch your actions; they become habits. Watch your habits; they become character. Watch your character; it becomes your destiny.” I would add: Even before thought, there is mind-set. Watch your mind-set; it underlies the entire system.

- *Commerce redesign*, to create the true service economy selling service—in the case of carpets: color, texture, design, acoustics, comfort, cleanliness – service, rather than product, retaining ownership in the means, and giving those products life after life in closed loop material flows; bringing about manifold improvement in resource efficiency.

I have told this story of personal and corporate transformation in greater detail in my own book, *Mid-Course Correction* (Chelsea Green Publishing Company, 1998).

Fast forward seven years to 2001. Deeply immersed in trying to expand my understanding of sustainability, as I have been since that 1994 awakening, I find myself reading another compelling book, Janine M. Benyus's *Biomimicry—Innovation Inspired by Nature* (William Morrow, 1997), recommended to me by David Oakey, Interface's Head of Product Design. A fascinating story is unfolding: An abalone quietly goes about building its protective shell from the “bottom up” as protein molecules self-assemble into a three dimensional latticework, like nano-scale apartment houses with protein walls, floors, and ceilings; then minerals, abundantly available in sea water, fill the cubical spaces to create the smooth and ultra-hard nacre. The walls and ceilings don't line up in neat grids the way an architect would design such a development at human scale. Rather, the partitions of protein are offset in all directions the way a good bricklayer knows to do. Miraculously, when stressed, this mother-of-pearl with built-in protein crack arresters, proves to be twice as difficult to break as the toughest ceramics made by the most “advanced” fossil fuel driven, heat, beat, treat methods known to man. But which protein? How does the abalone “know” to do this? Where in its DNA is the code to be found? Perhaps no one knows yet, though inquiring minds are seeking the answers,

because therein lie new insights into advanced material technologies not yet imagined.

Preparing for this speech, I wondered whether such inquiries were happening in our Ceramic Engineering schools? Were our ceramics majors engaged in the quest? Were they being exposed to nature's far better way? And I answered my wondering: Probably not, because I read that these pursuits are happening in biology laboratories with shoestring funding, while our universities remain locked in their traditional mind-set and curricula, teaching fossil fuel powered heat, beat, treat technologies—the very ones that industry is using to destroy the biosphere.

A similarly fascinating story follows the abalone's. It is the spider's production of its silk web, yielding a fiber that is five times stronger, pound for pound, than the aramide Kevlar®, the toughest man-made fiber yet developed by Dupont's heat, beat, treat technology which employs sulfuric acid at boiling temperatures. Kevlar is strong enough to stop a bullet, but a weakling compared with spider's silk, made from bugs at body temperature. And I wondered again whether our textile and chemistry students were learning nature's better way by studying spiders' silk. I answered my wondering again: Probably not, because I read that these studies are happening in biology laboratories with shoestring funding, while our universities remain locked in their traditional mind-set and curricula, teaching heat, beat, treat technologies—the very ones that industry is using to destroy the biosphere.

The emerging field of work, endeavoring to answer the question “How does nature do it?” in material sciences and a growing number of other fields, is “Biomimicry”—nature as model, nature as measure, nature as mentor. Biomimicry is in the early days of inspiring and helping define our sustainable future, not only in materials science, but also in food production (polycultural rather than monocultural, perennial rather than annual, crops); easier on the land, especially vanishing topsoil; in energy production (as scientists probe the mysteries of the complex physics and chemistry of nature's exclusive process of photosynthesis—easier on the atmosphere and climate); in medicine, e.g., pharmaceuticals that are identified by watching animals in the wild cure themselves naturally; in storing and retrieving knowledge (through studying shape-based computing, learned from how our own cells process information); in architecture (as we learn from termite mounds); and even in industry, as we begin to look to natural systems to teach us more intelligent organizing principles for production

that does not consume and destroy nature. Abundance through waste-free processes: that is nature's way. And we are light years behind in our feeble efforts thus far to emulate nature.

So I ask you who are shaping curricular and academic research: Why are our universities not teaching Biomimicry? Perhaps it is thought to be too new—and outrageous. Nature, 3.8 billion years old, is too new? Given the 50,000 year history of educating *homo sapiens* to *live with* nature, perhaps it is latter day ideas for *destroying* nature that are too new, and truly outrageous. The overpowering consideration that prompts the question about Biomimicry is the increasingly obvious destruction of the biosphere, being wrought by the industrial system that is being taught in our universities. The mind-set that grips the entire industrial system, of which our educational institutions are integral parts, takes nature for granted as if a finite Earth were infinite, both as a source of stuff and as a sink for the system's waste—yours, mine, everybody's. The universities, in their academic programs, credit requirements, curricula, course design, campus design, and campus operations, perpetuate this flawed mind-set from generation to generation, with scarcely a pang of conscience, much less a serious re-examination of the universities' roles in the destruction of the biosphere. Obsolete curricula are clear symptoms of this obsolete, flawed mind-set. And the clear evidence of the flaw is all around us in the form of declining natural systems upon which all else depends.

I ask about biomimicry by way of example, but biomimicry is only one aspect of the emerging, cutting edge thinking that has been inspired by the usual mother of invention, necessity; the necessity to find a better way to organize a civilization that wants to survive.

I could ask similar questions about other technical fields: renewable energy, closed loop material flows, reverse logistics, energy storage devices that are better than batteries, and green chemistry, e.g., enzymatic chemistry in water. Here, I refer you to the OECD (Organization for Economic Cooperation and Development) Task Force on “Biotech for Sustainable Industrial Development,” and its wonderful report of case studies; among them, the production of:

- PLA—textile fibers and polymers from corn dextrose;
- Amino acids—precursors to healthy food and feed;
- Acrylic acid—precursors to nylon and urethane polymers;
- Low temp polyester through enzymatic condensation of diols and diacids;

- Ethanol production from agricultural residue, cellulose into sugar; and
- Bleach removal from textiles to reduce processing energy; all from green chemistry (biotechnology) *not* being taught in our universities, which remain locked in their traditional mind-set and obsolete curricula—teaching destruction.

I could ask about economics and such issues as the elimination of perverse subsidies that incent bizarre behavior (tax credits for SUVs!), or such intriguing ideas as shifting taxes from good things (labor and capital) that you would like to encourage, not discourage through taxation, to bad things (waste and pollution) that you would really like to discourage, rather than encourage, even to subsidize; to internalize the externalities (the environmental and social costs) and to make prices ecologically and socially honest. I could ask about history and whether the extinctions of past civilizations, whose extractive economies led to their ecological collapse, are being studied seriously. The sad fact is that the answer is most likely overwhelmingly, “No,” as our universities continue to teach *and operate in*, the system that is destroying the biosphere.

I raise all these question, and imply hundreds more, to suggest that adherence to the old mind-set, the old curricula, obsolete pedagogy, and short-sighted planning, are producing graduates who are trained to perpetuate the destruction of the biosphere. Business, upon which so much depends, will never “get it” with graduates like these entering the work force. It is a crime against nature, numbering perhaps 30 million species (some think as many as 100 million), including humankind itself, for we are part of nature, not above it.

Why does this travesty go on? What are our educators thinking about? Do they think Earth is infinite in its ability to meet our ever-growing wants (not *needs*, *wants*) here in the rich North? Do they think Earth is infinite in its ability to absorb and assimilate the waste from our heat, beat, treat, destructive, voracious, consuming technologies? Maybe they think we have all the time in the world to correct these errors. We don't. The Union of Concerned Scientists, in their *Urgent Warning to Humanity* (1992), concludes: “No more than one or a few decades remain before the chance to avert the threats we now confront will be lost and the prospects for humanity immeasurably diminished.” Here we are, more than a decade later. Maybe our educators think that all this is someone else's job, maybe another generation's. It isn't. The challenge is *now*.

What *are* they thinking? Are you, they? What an awesome responsibility to assume, presuming to send graduates into the world trained in the traditional way which is, in effect, destroying life on Earth! The educational system is failing society, more precisely, society's future. It is a crime. Dr. Colwell spoke of obstacles in the educational system. That's putting it kindly.

The crime is occurring in subject after subject, field after field. Our economics students are taught a system of economics in which the externalities do not count—a market system that externalizes life itself. Does, for example, the price of a pack of cigarettes, established by the market in its revered wisdom, reflect its cost? Not close, considering the societal costs associated with smoking; but does the market, as we teach it, care? No.

Does the price of oil, established by the market in its revered wisdom, reflect its cost? Not close, considering the military power projected into the Middle East to protect the oil at its source, not to mention the occasional Gulf War and the future costs of global warming, such as 9000 square miles of America that will disappear under rising sea levels, *this* century alone. Who knows what the 22nd Century will bring. But does the market as we teach it care? No. Do the accounting systems taught to our business students reflect this inescapable reality? No. Yet, long ago, Einstein said, "Everything counted does not necessarily count, and everything that counts cannot be counted." And, by the way, in how many of our universities are the causes of global warming, itself—the burning of fossil fuels for energy—being taught, and the research and development of alternative energy sources being pursued?

Instead, we continue to teach economics students to trust the "invisible hand" of the market, when the invisible hand is clearly blind to the externalities, and treats massive subsidies, such as a war to protect oil for the oil companies, as if the subsidies were deserved. Can we really trust a *blind* invisible hand to allocate resources rationally? Meanwhile, we continue to teach extractive, linear, wasteful, abusive technologies whose essential characteristics date from the dawn of the industrial revolution. They are producing more sophisticated products, to be sure, but by the same fossil fuel powered, brute, abusive force that Thomas Newcomen harnessed to drive the first steam driven pump in 1712, the dawn of the industrial revolution. And our universities, in their daily operation, set terrible examples by contributing to the abuse.

The tragedy is that our graduates, steeped in traditional technical education, liberal arts, economics, and the humanities, are themselves too often emerging from our universities blind to reality – oblivious to the realities of a finite Earth. Blind to a growing population with increasingly unsatisfied needs—*needs, not* wants—two-thirds of the human population essentially left out of the modern industrial and economic system; half of Earth's people subsisting on two dollars a day, or less. Why do our graduates (the few who do) have to enter the Peace Corp to learn these stark facts of life and death?

How many of our graduates are being taught to ask, for example, *why* China's Gobi Desert is spreading and generating dust storms that now reach Denver? Do you know? Does your Dean of Science know, or care? How many of our universities operate as if the Gobi Desert was of no concern to them, though the Gobi's dust storms become Seattle's and Denver's fallout this year and, maybe, New York's next year? How many of our graduates are being taught to ask about the causes or consequences of species extinction? How many of our universities operate as if they had no responsibility for species extinction, though their furniture and their President's office paneling are produced from rainforest mahogany? How many of our graduates are learning to measure the industrial metabolism of our factories, its effects throughout the supply chain, from mine and wellhead to landfill or incinerator, and the mountains of waste generated to satisfy society's wants? How many of our universities operate as if their own waste could be thrown away (out of sight, out of mind), though their thermodynamics courses teach clearly there is no "away?" And how many are learning about alternative industrial systems with factor 10 improvements in resource productivity? How many are learning green chemistry? How many are learning to design cities for no sprawl, or to structure laws and incentives to encourage the implementation of such designs? How many are learning about the connections that lead to the vicious cycle of poverty and environmental destruction? Down and down they spiral together! How many of our universities are teaching through precept *or* example, ways to redress the overwhelming reality of our times, the deterioration and eventual collapse of the global biosphere, and humanity along with it? For, if we persist in the present system, the one that is being taught and lived and practiced in those same universities, collapse is what we will surely get.

“Watson, you idiot, someone has stolen our tent.”

Watson overlooked the obvious and got caught up in the details of the firmament. What does that mean to us, here? I heard it first from Tim Wirth, former Undersecretary of State for Global Affairs, though I think he may have heard it from Sylvia Earle. Tim said, “Get it straight, don’t overlook the obvious. The economy is the wholly owned subsidiary of the environment. It’s not the other way ‘round, the way an economist might have you believe. The economy is the child, the environment is the parent. We cannot hope to have a prosperous child without a healthy parent.” Thinking about that, I asked myself, “What CEO do I know who, given a subsidiary that required a constant, continual infusion of capital (natural capital, in this instance) just to keep going, would hold on to that subsidiary for very long?” Not one that I know of, and I’m pretty sure Nature is a better manager than any CEO I know, and capable of being far more ruthless if she needs to be.

The biosphere’s capacity to supply nature’s services—air (plant transpiration), water purification and distribution (the hydrologic cycle), soil formation and maintenance (thus food), pollination and seed dispersal (thus primary production), insect control, nutrient cycling, the processing of our wastes, without *any of which* human survival is impossible—is threatened as never before. When our educators finally confront the question, Why?, they need only look in their mirror for the answer. Of course, they will have plenty of company in that mirror’s reflection—an entire industrial, economic, as well as educational, system that has been led down the garden path by a blind invisible hand. It is time to change that, and time is short.

The title of this conference is “Education for a Sustainable and Secure Future.” We may not want to hear it, denial is easier, but we have a long way to go.

Change is often hard and sometimes painful. Yet it need not be, as we have learned at Interface, and the pain that is in store for humanity and the species with which we share Planet Earth will be infinitely greater if we don’t change. But, who will lead? Unless somebody does, nobody will. Why not you? If you have the courage and wisdom to seek change, then, to quote Gandhi, you must be the change. That is leadership. The question is, can education lead? Or can only business lead? It really doesn’t matter. Education must be part of the solution.

The truth is, we have an essentially illiterate populace when it comes to the environment. Our brightest minds, at least—the ones you shape—have just got to “get it.” As Paul Hawken says in *The Ecology of Commerce*, “The average adult American can identify 1000 commercial brands and a dozen species of plants.” That must change.

It is time for our educators, especially at the university level, to get off the sidelines as spectators and into the game as participants. If Paul Hawken *is* right that only business can lead, who will prepare tomorrow’s business leaders to lead *responsibly*? You and your associates! Environmental and social responsibility are critical—as much as financial responsibility. So, challenge the status quo that, today, is preparing leaders to lead irresponsibly, because vast ignorance of the problem is allowed to abound. If your job is to dispel ignorance, then put ecological and social ignorance at the top of your priorities. Let your research help define the path society should choose for *survival of homo sapiens*, not its extinction, and the preservation of those other 30 million species.

Finally, set an example: green your campus operations and buildings, and green your supply chains. If you want to reduce your environmental footprint and show students, faculty, and administrators how, the quickest and surest way is to deal with those suppliers who have already reduced theirs. If you don’t know who they are, find them; that is a good place to start learning from those who are doing it, the early movers.

This year’s entering kindergarten class is your college graduating class of 2020. That happens to be the year by which we intend for Interface to be totally sustainable. What will those graduates need to have learned if they want to work for my company or our suppliers? Certainly not heat, beat, treat technologies, not petroleum geology or petroleum engineering, not blind economics, not internal combustion engines, not the chemistry to make the next CFC or PCB, not the social pap of the rich North, and not globalization of a totally flawed industrial and economic system.

Instead, get them ready for a different future. Paradigms are shifting. The folly of the prevailing paradigm, represented by the “modern” industrial system, stands exposed in all its errors. A new paradigm is taking hold: *waste-free, renewable, cyclical, resource efficient, benign, socially*

*equitable, in harmony with nature.* Get it into your curricula, pedagogy, research, operations, and supply chains now. There is no time left for pondering, much less denial.

I have entitled this speech: “A Call for Systemic Change.” That’s what I am presumptuous enough to call on you to create in education. I do not ask you to do anything I am not trying to do in industry. Unless somebody leads, nobody will. Why not you?

Let me conclude by telling you what drives me. Why is all this so important? I will sum up with the ultimate reason, as I close with this personal story. If we listen carefully we can hear a distant cry from someone we know but may not have met, yet. Let me tell you how I came to know this person. On a Tuesday morning in March 1996, I talked about all of this to the Bentley Mills (one of the Interface companies) sales force during their annual sales meeting,

bringing them along, but not knowing whether I was connecting. A few days later, over my e-mail, totally out of the blue, came an original poem, composed after that meeting by one of the Tuesday morning participants. It was one of the most encouraging moments of my life, because it told me that at least one person in that Tuesday morning audience (and I think he surely represented many people) “got it.” Here’s what Glenn Thomas wrote [see below]:

Tomorrow’s Child speaks to us across the generations with a simple, but profound message: “We are all part of the web of life. During our brief visit here, we have a choice to make: we can either help it or hurt it. The old mind-set or the new? Exploitation and destruction, or restoration? Which will it be? Every day of your life with every action you take, every investment you make, everything you buy and every student you teach—it’s your call.

#### TOMORROW’S CHILD

Without a name; an unseen face  
and knowing not your time nor place  
Tomorrow’s Child, though yet unborn,  
I saw you first last Tuesday morn.

A wise friend introduced us two,  
and through his shining point of view  
I saw a day which you would see;  
A day for you, and not for me.

Knowing you has changed my thinking,  
for I never had an inkling

That perhaps the things I do  
might someday, somehow, threaten you.

Tomorrow’s Child, my daughter-son,  
I’m afraid I’ve just begun  
To think of you and of your good,  
Though always having known I should.

Begin I will to weigh the cost  
of what I squander; what is lost  
If ever I forget that you  
will someday come to live here too.

Glenn Thomas, ©1996

# NCSE LIFETIME ACHIEVEMENT AWARD

**Presented to Honorable Gaylord Nelson  
Former Governor of Wisconsin, Retired U.S. Senator,  
Founder of Earth Day, Counselor of The Wilderness Society**



**GAYLORD NELSON, FOUNDER OF EARTH DAY, AND FORMER U.S. SENATOR AND GOVERNOR OF WISCONSIN**, received NCSE's second Lifetime Achievement Award on January 31, 2003. The award was presented by Denis Hayes, coordinator of the first Earth Day, former NCSE Board Member, and President of the Bullitt Foundation.

Nelson accepted his award with optimistic words about students' increasing knowledge and understanding of environmental issues. Referring to the talks he has given in schools every Earth Day for the past three decades, Nelson said that "grade-schoolers are asking more sophisticated questions [about the environment] than college seniors were in the 1970s."

Nelson was honored for a lifetime of leadership in environmental issues, particularly in the areas of land conservation and environmental education. He is best known for founding Earth Day in 1970, which was an instant success, drawing 200 million people in its first year. American Heritage Magazine called it "one of the most remarkable happenings in the history of democracy."

Nelson received a BA from San Jose State College and a law degree from the University of Wisconsin in 1942. He began his public service in 1948 as a state senator and was reelected three times. He was elected Governor of Wisconsin in 1958, and after serving two terms, was elected to the U.S. Senate in 1962. Nelson was reelected in 1968 and 1974, serving a total of 18 years.

In 1961, Governor Nelson created the Outdoor Recreation Acquisition Program to acquire one million acres of Wisconsin parkland, wetlands, and other open space. During his time in the U.S. Senate, he authored legislation to preserve the 2,100-mile Appalachian Trail corridor and to create a national hiking trails system. He also sponsored or co-sponsored countless conservation bills, including the Wilderness Act and the Alaska Lands Act.

After leaving the Senate in January 1981, Nelson has been working for the environment as a counselor of The Wilderness Society. He has been involved with various land preservation issues, including the elimination of logging subsidies, protection of national parks, and the expansion of the National Wilderness Preservation System.

In 1995, Nelson received the nation's highest civilian award, the Presidential Medal of Freedom. In 1992, the United Nations Environment Programme presented Nelson with the Only One World Award. In 2002, the University of Wisconsin Board of Regents renamed the institute of environmental studies at the University of Wisconsin–Madison as the Gaylord Nelson Institute of Environmental Studies.

# NCSE CONGRESSIONAL LEADERSHIP AWARD

**Presented to Congressman Vernon Ehlers, Chairman, Subcommittee on Environment, Technology and Standards, Science Committee, U.S. House of Representatives**

*Presented in June 2003 at the release of this report*



**U.S. REPRESENTATIVE VERNON J. EHLERS OF MICHIGAN** is the recipient of the National Council for Science and the Environment's (NCSE) third Congressional Leadership Award. Dr. Ehlers serves as Chairman of the Subcommittee on Environment, Technology and Standards of the Science Committee.

NCSE Executive Director Peter Saundry stated, "Congressman Ehlers, one of the few scientists in Congress, has been a champion for science, education and scientific approaches to environmental protection from the moment that he began his service in 1994. In addition to his legislative activities, Congressman Ehlers has been a leader in educating his colleagues about the importance of science, the need for science funding, and about environmental threats such as invasive species and climate change."

Vernon Ehlers is in his fifth full term in the U.S. House of Representatives. He produced a Science Committee report presenting a new national science policy<sup>1</sup> that stated, "The emergence of environmental threats over the last half century has elevated environmental issues to a position of importance ranking alongside the need to protect our national security, improve people's health and strengthen the economy" (p. 48).

Ehlers also is a member of the Education and the Workforce Committee, where he blends his efforts with the Science Committee on improving math and science education. His legislation, the National Science Education Act, aimed at reforming our nation's K-12 science, mathematics, engineering, and technology education became law in 2002. Ehlers led the development of the Great Lakes Legacy Act, which authorizes spending \$270 million over the next five years to clean up sediments in the Great Lakes and has introduced several bills to deal with the environmental and economic disruption caused by invasive species. As a member of the House Administration Committee, he has guided the program to revamp the House computer system, connect Congress to the Internet and allow all citizens to access House documents.

The first research physicist to serve in Congress, Ehlers received his undergraduate degree in physics from Calvin College and his Ph.D. in nuclear physics from the University of California at Berkeley in 1960. After six years teaching and conducting research at Berkeley, he moved to Calvin College where he taught physics for 16 years and later served as chairman of the Physics Department. He has served on numerous boards and commissions and was elected to the Kent County Board of Commissioners, where he served for eight years, and the Michigan House and Senate, where he served for a total of 11 years.

Previous recipients of the NCSE Congressional Leadership Award have been Representative James Saxton of New Jersey and Representative Sherwood Boehlert of New York.



# APPENDICES

**APPENDIX A:** Ubuntu Declaration on Education and Science and Technology for Sustainable Development

**APPENDIX B:** Environmental education activities at the National Oceanic and Atmospheric Administration (NOAA)

**APPENDIX C:** Sustainability and environmental education at the U.S. Environmental Protection Agency (EPA)

**APPENDIX D:** Conference participants

**APPENDIX E:** Conference exhibitors

**APPENDIX F:** Conference sponsors

**APPENDIX G:** University Affiliate Program members

# UBUNTU DECLARATION ON EDUCATION AND SCIENCE AND TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT

## Appendix A

The Ubuntu Declaration on Education and Science and Technology for Sustainable Development seeks to integrate sustainable development concepts into the curricula at every level of education worldwide. It was issued by leading education and scientific organizations at the World Summit on Sustainable Development in Johannesburg, South Africa in 2002.

**IN AN EFFORT TO MAKE INTEGRATED SOLUTIONS** work for sustainable development and to mobilize the education sector to contribute to sustainable development, we, the education and scientific organizations of the world, United Nations University; United Nations Educational, Scientific and Cultural Organization; African Academy of Science; International Council for Science; International Association of Universities; Copernicus-Campus; Global Higher Education for Sustainability Partnership; Science Council of Asia; Third World Academy of Sciences; University Leaders for a Sustainable Future; and World Federation of Engineering Organizations...

*...call for an initiative to strengthen science and technology education for sustainable development:*

- Cognizant that integrated solutions for sustainable development depend on the continued and effective application of science and technology, and that education is critical in galvanizing the approach to the challenges of sustainable development.
- Endorsing the Earth Charter as the inspiring, fundamental and balanced set of principles and guidelines for building a just, sustainable and peaceful global society in the 21st century, which should permeate all levels and sectors of education.
- Noting that science is all science—natural, social and human.
- Recognizing the necessity to bridge the knowledge gap between the nations of the world through a fundamental redress of the distribution of education for sustainability.

- Acknowledging that the ultimate goal of education in all its forms is to impart knowledge, skills and values to empower people to bring about changes.
- Concerned that education has not been utilized as a vehicle for attaining sustainable development.
- Reaffirming the indispensable role of education in achieving sustainable development, and the important role education plays in the mobilization of science and technology for sustainability as contained in Chapter 36 of Agenda 21.
- Recalling the Lüneburg Declaration on Higher Education for Sustainable Development of 10 October 2001, and its emphasis on the indispensable role of higher education informing and supporting all education in addressing the critical challenges of sustainable development.
- And recognizing that the Scientific and Technological community, as represented by the International Council for Science, Third World Academy of Sciences, and World Federation of Engineering Organizations in the WSSD process has called for a new social contract between science and technology and society for sustainable development.
- Determined to work towards the goals contained in the Millennium Declaration, Monterrey Consensus and the Doha Development Declaration.

*...call on Governments of the World Summit for Sustainable Development and the Post-Summit agenda to:*

- Designate educators as the tenth stakeholder group in the WSSD process.

*...call on educators, Government and all relevant stakeholders to:*

- Review the programmes and curricula of schools and universities, in order to better address the challenges and opportunities of sustainable development, with a focus on:
  - Plans at the local, regional and national country levels;
  - Creating learning modules which bring skills, knowledge, reflections, ethics and values together in a balanced way;
  - Problem-based education at primary and secondary levels in order to develop integrated and non-instrumental approaches to problem solving at an early stage in the education cycle;
  - Problem-based scientific research in tertiary education, both as a pedagogical approach and as a research function;
- Promote efforts to attract young people to the teacher profession both to meet the Millennium Development goals of universal access to primary education as well as to further strengthen primary, secondary and tertiary education. In developed countries the major challenge in the coming years will be to offset the high outflows of experienced teachers reaching retirement age or taking up other challenges.

- Develop mechanisms to continuously inform teachers and update programmes on major progress in scientific and technological knowledge relevant for sustainable development.
- Promote knowledge transfers in innovative ways in order to speed up the process of bridging gaps and inequalities in knowledge. This is the shared responsibility of teachers, schools, research and education institutions and governments.
- To achieve these challenges and objectives, we are resolved to work towards a new global learning space on education and sustainability that promotes cooperation and exchange between institutions at all levels and in all sectors of education around the world. This space must be developed on the basis of international networks of institutions and the creation of regional centers of excellence, which bring together universities, polytechnics, and institutions of secondary education and primary schools. We invite all other responsible stakeholders to join us in this endeavour.

# ENVIRONMENTAL EDUCATION ACTIVITIES AT THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

## Appendix B

**NOAA HAS RECENTLY REWRITTEN** its strategic plan to highlight the importance of education and outreach to its mission. The agency has primary responsibility in the federal government for the stewardship of our nation's coastal and marine resources, as well as a mandate to lead scientific research on the Earth's oceans and atmosphere. Environmental education of the public is thus closely connected to everything we do. As we look to the future, NOAA, as much as any federal agency, is making a concerted effort to ensure a sustainable and secure future for us all by working to educate the public and improve environmental literacy. Our daily focus on the complex systems that make up the planet make it clear to us—there can be no healthy, safe and vibrant future without a healthy, safe and vibrant environment. This message must be communicated to the public and NOAA is continually developing new ways to do so.

The Teacher At Sea program allows teachers from elementary school through college go to sea aboard NOAA research and survey ships to work under the tutelage of scientists and crew. Now in its 12th year, the program has enabled more than 360 teachers to gain first-hand experience of science at sea. Teachers can enrich their classroom curricula with a depth of understanding made possible by living and working side-by-side, day and night, with those who contribute to the world's body of scientific knowledge.

NOAA's Educational Partnership Program with MSIs (EPP/MSI) is designed to support the development of quality education to students while meeting the prescribed goals of NOAA and the nation. Working with partner MSIs

and other research and federal government institutions, the NOAA program provides opportunities and develops curricula for students to pursue careers in atmospheric, environmental and oceanic sciences and remote sensing.

Do you want to find the latest Great Lakes sea-surface temperatures, information on the fish-killing *Pfiesteria* dinoflagellate, a recipe for crab cakes, how to start a fish farm, or facts about marine science careers? All this information and more can found on the wide variety of World Wide Web pages sponsored by the 30 Sea Grant programs that constitute the National Sea Grant College Program, a partnership of academia, government, and industry. These Sea Grant programs are based at universities in coastal and Great Lakes states and Puerto Rico. They conduct research, education, and outreach to help the nation wisely use and conserve its coastal, ocean, and Great Lakes resources for a better economy and environment.

Sea Grant programs do research, education, and outreach in the following areas:

- Aquaculture
- Biotechnology
- Coastal Communities and Economies
- Coastal Hazards
- Ecosystems and Habitats
- Education and Human Resources
- Fisheries
- Invasive Species
- Ocean and Coastal Technologies
- Seafood Science and Safety
- Urban Coast, Ports and Harbors

The National Marine Sanctuaries Act of 1972 that established our nation's marine sanctuaries set forth several specific national goals. Science and education were two critically important goals identified in the Act. Guided by these legislative goals, the national program and field offices have evolved major scientific and education programs and activities over the past two decades. Our national marine sanctuaries provide excellent opportunities for classroom and public education. In many cases, a sanctuary provides a "hands-on" laboratory where people can see, touch, and learn about the greater ocean ecosystem. In other cases, the sanctuary is figuratively brought to the classroom and into public education awareness. However, no matter where they are located, all of our sanctuaries can be considered living classrooms.

The National Estuarine Research Reserve System protects more than one million acres of estuarine habitat, conducts essential research and provides a variety of educational

opportunities. Individual National Estuarine Research Reserves focus on local and regional research and educational needs, but as a national network, there are also many system-wide programs. These programs provide reserves with common research standards and educational goals.

In addition, NOAA maintains a wide range of climate, oceanographic, weather, fisheries and other kinds of labs, many of which offer opportunities for students and the public for tours and other educational activities. These labs are located throughout the country and many have their own education and outreach coordinator who is responsible for engaging with the surrounding community.

For more information, contact the Office of Education and Sustainable Development at (202) 482-3384.

# SUSTAINABILITY AND ENVIRONMENTAL EDUCATION AT THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

## Appendix C

**THE ENVIRONMENTAL PROTECTION AGENCY (EPA)** supports sustainability education for researchers, students, industry, and communities engaged in different disciplines and sectors, as well as for its own staff. Such educational programs continue to enable our society as a whole to take a longer term, more integrated approach to effective environmental and human health protection.

The Agency has a number of programs in green engineering, industrial ecology, smart growth, ecology, and environmental futures that are helping to build a community of scientists, engineers, and practitioners who integrate the environment and sustainability into their work. For example, the EPA has co-sponsored the development of a green chemical engineering textbook, *Green Engineering: Environmentally Conscious Design of Chemical Processes* (co-authored by David Allen and David Shonnard). This text is written for college senior-to-graduate-level engineering education, and it is used currently in the chemical engineering curriculum at over forty universities.

Under the Science to Achieve Results (STAR) research grants program, EPA has partnered for seven years with the National Science Foundation on a joint solicitation called Technology for a Sustainable Environment. The university research supported under this program addresses technological environmental issues of design, synthesis, processing, and the production, use, and ultimate disposition of products in construction and in continuous and discrete manufacturing industries, as well as the broader systems tools and approaches of industrial ecology. More than 150

grants have been awarded under this program, with each grant providing educational benefits to graduate students and principal investigators.

STAR research and Office of Research and Development intramural ecology research projects tie together into a larger sustainability vision through the Environmental Monitoring and Assessment Program (EMAP) and its component programs. EMAP develops the tools necessary to monitor and assess the status and trends of national ecological resources. EMAP's goal is to develop the scientific understanding for translating environmental monitoring data from multiple spatial and temporal scales into assessments of ecological condition and forecasts of future risks to our natural resources. Significantly, EMAP investigates, develops and validates indicators used to monitor, and subsequently assess, the condition of ecological resources. Principal investigators and graduate students derive educational benefits from their engagement in this research.

Since its inception in 1996, the STAR graduate fellowship program has supported over 700 of the Nation's top graduate students conducting research on environmental questions. Disciplinary areas represented have ranged from engineering to social science. Many of the projects supported under the program have focused on science and engineering to support sustainability.

The Presidential Green Chemistry Challenge Award promotes pollution prevention through an EPA Design for the Environment partnership with the chemistry

community. Through high level recognition and support, the Challenge promotes innovative developments in and uses of green chemistry for pollution prevention. Also, EPA sponsors the annual Smart Growth Achievement Award that recognizes development projects with clear environmental benefits including improved air and water quality, greater preservation of critical habitat and open space, and more clean up and re-use of brownfield sites.

EPA also cosponsors conferences in these fields. For example, this year EPA is sponsoring—through the Engineering Roundtable—a conference on “Green Engineering: Defining the Principles” that is designed to produce a set of principles of green engineering. Also, for the past seven years, EPA has sponsored, through the American Chemical Society, the Green Chemistry and Engineering Conference. This conference has grown a community of researchers and practitioners who are engaged in science to achieve sustainability.

In addition to education of the public, there is also informal internal education on EPA’s role in sustainability. The EPA Millennium Lecture Series invites environmental experts from outside the Agency to share their thoughts as they look ahead at significant issues and opportunities

in environmental protection. The series emphasizes topics involving resources, design, sustainability, and industrial ecology. EPA also jointly sponsors the Smart Growth Speaker Series, held at the National Building Museum. Also, there are ongoing workshops and lectures on environmental futures, with a goal of directing more attention toward the highest priority emerging challenges and developing more preventive approaches. Ideally, these projects can be the first step in the development of a continuous, institutionalized foresight activity for EPA.

Finally, some exciting, new efforts are underway. First, the EPA sustainability group is developing a course for management and staff on sustainability and EPA’s role. The course will focus on tools, methods, and exercises that will enable EPA management and staff to develop a more systems-oriented, preventative, forward-looking approach in their daily work. Second, EPA is at the early stages of developing an exciting new collaboration with the National Academy of Science and others in which researchers, policy-makers, and industrial decision-makers, will work together on projects designed to move us along a collectively-defined, sustainable path.

# CONFERENCE PARTICIPANTS

## Appendix D

\* Members of the NCSE conference planning and advisory committees are denoted with an asterisk.

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The National Council for Science and the Environment is a 501(c)(3) nonprofit organization which carries out educational activities, promotes science for the environment, and strengthens science programs. NCSE's work is funded by foundations, Affiliate Universities, corporations, government agencies, and individuals.

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ISBN 0-9710439-5-7



Printed on recycled paper with soy inks