AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
AMERICAN SOCIETY FOR ENGINEERING EDUCATION (ASEE)
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS (AICHE)

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Engineers Forum on Sustainability

INSIDE THIS ISSUE:

Engineering Community Promotes Capacity Building in Engineering and Technology

A major theme of this issue of the Forum Newsletter is the collaborative efforts of both the national and international engineering communities to promote capacity building in engineering and technology for poverty eradication, security, and sustainable economic and social development. A major program initiative is described, and a special guest article written by the President of the World Federation of Engineering Organizations amplifies this critical role for the engineering profession. Several other articles discuss capacity building, and U.S. initiatives underway to address international energy and water needs.

This Issue also includes a number of articles on sustainability education, sustainability indicators, and other developments in sustainable engineering practice. We hope you will find all of these articles informative and useful.

The next meeting of the *Engineers Forum on Sustainability* is scheduled for Friday, September 19, 2003, in the Lecture Room of the National Academy of Engineering in Washington, D.C. The Forum will meet from 9 AM to Noon, and the Engineers International Roundtable will meet in the same room from 1 PM to 4 PM. Please mark your calendars for these two events. Detailed agendas will be e-mailed to you prior to the meetings.

-- Al Grant – Forum Chair

Engineers: A Key Partner in Knowledge and Technology Transfer

(Ed. Note: This article is the ninth in a series of special guest articles featured in the Forum Newsletter. It was written by Prof. Dr. Ing. Jose Medem, President of the World Federation of Engineering Societies (WFEO). It is drawn from a presentation by the author in Johannesburg, South Africa during the World Summit on Sustainable Development in September 2002.)

1. Evolution and Practice of the Engineering Profession

The world of engineers is very complex and not easy to understand. The engineering profession is a sum of different parts which do not really make up a whole. This is easily understandable as it reflects the situation of the world itself. Geography, climate, natural and human resources, history, culture, tradition, idiosyncrasy and language deeply differ from one country to another and even within the same country, and in each of them the adaptation to modern technology and industrial and economic development has been achieved through very different ways.

The term "engineering profession" is difficult to define. Many international organizations related to this profession have tried for many years to find a general definition of an engineer, which could be applied to all the engineers belonging to the different professional associations. This proposed definition should include the following abilities for engineering practice:

- Apply mathematics, science and engineering science for the design, operation and improvement of systems, processes and machines; Formulate and solve complex engineering problems;
- Understand and resolve the environmental, economic, societal implications of engineering work; Communicate effectively;
- Engage in continuing education and professional development;
- Act in accordance with the ethical principles of the engineering profession;
- Function in contemporary society.

Engineers: A Key Partner in Knowledge continued

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2. Engineering and Society

Engineers have made an important contribution to society throughout history, although that contribution has been undervalued. Today daily life in developed countries is filled with sophisticated technology and the resulting conveniences and extended possibilities offered to individuals in their private and business lives are no longer consciously perceived. Only failures remind people how much they depend upon technology and, then, they become angry.

Yet, a simple look at the modern way of living is sufficient to understand that technology is everywhere: food and drinks, clothes, housing, town planning, water supply, transportation, communication, medical equipment, banking, sport, art, defense, security. There is no essential aspect of life today that is not dependent on sophisticated technology. Any technical sector failure raises immediately serious and extended difficulties.

It is generally admitted that technology stems from science and develops by using applied or engineering science. So, engineers could be defined as mediators between science and the practical problems of life. Their task is to use scientific results for improving the well-being of individuals and society, and to find the best possible economical solutions for that purpose. They are the true creators of economic prosperity of the developing and of the developed world.

3. Science, Engineering and Technology

The contribution of Science, Engineering and Technology (SET) to the development and well-being of humankind are substantial, but each of them performs a different role:

- Science both investigates and attempts to discover, understand, explain and forecast the structure, characteristics and functioning of both nature and human beings and their cultures.
- Engineering is applying science and traditional knowledge to satisfy human and environmental needs, designing, building and managing capital intensive projects and systems, and assessing, selecting and modifying creatively technological options in order to solve practical problems.
- Technology is about inventing new materials, devices, systems and methods, using innovation and expert know-how.

Each perform a different role but with complementary and significant contributions to development.

Developing countries face engineering problems that are in many cases different than those of developed countries. Many of the critical environmental problems they face today are related to water, energy, food security and waste management. Moreover, the very rapid growth of mega-cities in poor countries requires technology for transportation and utilities with unprecedented capacity, which must be rugged and at very low cost. These involve low tech solutions, which are available now, can be easily adapted, applied immediately and distributed broadly. Engineers can address these opportunities and deliver near term solutions to immediate problems using proven technology. The sharing of this knowledge is facilitated by using electronic networks to transmit information and discuss proposals.

4. Knowledge and Technology Transfer

Engineers are often thought as being solely involved with the technical aspects of projects, but today they often manage the entire implementation team, supervise the process and operate the working systems. This gives them the opportunity to take the holistic approach required in the consideration of sustainable development principles, setting the ground for an optimum and informed decision-making process that combines the efficacy of technical solutions with its economic efficiency, social acceptability and ecological integrity. This also means optimizing the decisions by informing, consulting and raising public perceptions and participation into project design and technology selection. The specific inclusion of long-range environmental impacts and costs in each alternative under consideration is where engineers have the opportunity and the responsibility to implement most effectively sustainable development. We, as engineers, have a demonstrated capability to do this, and we need to take this greater role in applying interdisciplinary our systems analysis techniques more widely in human and economic development. This engineering function is crucial to put into practice the principles of sustainable development.

We understand that traditional aptitudes of engineers to implement development have been challenged in search of sustainability. We accept this challenge. Now engineering is using new analytical tools and procedures that, supported by new technological aids for measurements, calculation and forecast, allow engineers to select the best option among different alternatives by considering sustainability and socioeconomic aspects.

So, engineers play a key role and add essential value to development in designing and building a sustainable future. We provide the interface among science, society and the decision making bodies to assure that the best available science and technologies are implemented, with sound interaction among the different actors and beneficiaries, "*to meet the needs of present generations without forecasting options to future generations*".

The changes that have produced our global, interdependent civilization are

Engineers: A Key Partner in Knowledge continued

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rooted in the advances in knowledge, technology and production capacity that have taken place over the past several millennia, particularly during the twentieth century. But the rate of change experienced in our lifetime is unique, without precedent. This evolution applies particularly to the information and communication technology with an increasing digital divide between developed and developing countries. Our growing society of knowledge has the moral obligation of a global cooperation for knowledge dissemination, sharing with the developing countries and transferring to them the best available knowledge in order to reach a more equitable global distribution of knowledge.

The application of these ideas will motivate and empower engineers of developing countries to be committed to be effective and responsible champions for the rapid implementation of sustainable development. For developing countries we should improve the integration and coordination internationally of information and knowledge resources, through networks and partnerships covering the North and the South and we should strengthen the supply of information through social networks, based on different kinds of linkages like family, neighbours, friends, work, etc.

Technology transfer is a key factor in growth and employment and it is one of the best ways to make enterprise innovative and internationally competitive. But it is a complex subject with many interrelated aspects like differences in culture, traditions, language and legal systems, the wide range of training and professional qualifications, the absence of an international patent structure, etc. Removing these barriers to greater cross-border cooperation between countries and enterprises is a real challenge. Its realisation will lead to substantial growth. But without people, without the human factor, there is no technology transfer.

Engineering must increase its focus on sharing and disseminating sound information, knowledge and appropriate technology that provides access to energy, water, food, health and other basic human needs.

The goal of improving the economic well being of lesser-developed countries, and of reducing the poverty of the third world is a prerequisite for creating a stable sustainable world. According to Gandhi's statement "poverty is the greatest polluter of all".

The role of the professional engineering and technology community in poverty reduction includes advice, advocacy, information, communication, project, and programme activity at the national, regional and international level relating to technology and knowledge transfer, education and training, human improvement of innovations systems, development of information sharing, and resource development, human and institutional capacity building in engineering and technology.

FIDIC - International Federation of Consulting Engineers, WFEO - World Federation of Engineering Organizations, and the World Bank Development Gateway are finalizing an agreement with UNEP/GEF SaNet which focuses on technology and knowledge transfer to support Multilateral Environmental Agreements. The agreement will facilitate systematic collaboration between members, affiliates and clients of WFEO and FIDIC and the UNEP-GEF Technology Transfer Networks (SANet) with a view to increasing the uptake of sustainable technologies, related products and services in developing countries and countries with economies in transition.

WFEO, FIDIC and UNEP-GEF are interested in facilitating increased utilization of expert know-how and technologies necessary to develop and implement sustainable business solutions that help to protect the global environment. All stakeholders will work together in the following areas:

- Technology and knowledge transfer enabling measures like dissemination of information, training and business planning tools, exchange of "win-win" know-how and best practice case stories, and facilitation of market development-networks and alliances;
- Referral of experts with proven expertise in establishing specific win-win solutions and on-line advice.

Encourage co-financing by private and public financiers to facilitate the transfer of cleaner technologies.

Major Collaboration Proposed for World Engineering Community

A program "Engineering for a Better World - Engineering and Technology for International Development" is proposed by the World Federation of Engineering Organizations in collaboration with UNESCO, the American Association of Engineering Societies (AAES), National Academy of Engineering (NAE) and the US Department of State. The program is designed to promote capacity building in engineering and technology for poverty eradication, security and sustainable economic and social development. The proponents invite interested governments and other engineering associations to actively support this proposal as an integral element of the UNESCO work program.

Major Collaboration Proposed continued

(Continued from page 3)

The application of knowledge in engineering and technology underpins and drives sustainable economic and social development. The exchange of knowledge is essential to bridge the "knowledge divide" and create linkages to promote intercultural dialogue, meet basic human needs and reduce poverty in the developing countries.

The importance of the engineering sciences and technology in driving sustainable economic and social development and addressing basic needs was emphasized at both the World Engineers' Convention in 2000 and the World Conference on Science in 1999. There is increasing concern regarding the capacity of countries around the world to apply engineering and technology for development and poverty reduction at a time when research has demonstrated the strong linkage between engineering and technology and sustained economic growth. There is a compelling need to strengthen the capacity of UNESCO in engineering sciences to assist member states.

In support of the core objectives of the Johannesburg World Summit on Sustainable Development (WSSD) last September, UNESCO initiated a number of partnerships with NGOs to address priority areas. National governments also made specific commitments at WSSD in support of the UN Millennium Development Goals.

The overall strategy of UNESCO and of "Engineering For a Better World" is to promote human and institutional capacity building to reflect these WSSD and UN Millennium Development Goals and UNESCO priorities and Medium Term Strategy. These include sustainable development and poverty eradication, Africa and NEPAD (New Partnership for Africa) priorities, LDCs (Least Developed States), small island states, young people, women and gender issues in engineering.

This Program will directly facilitate strengthening the engineering, sciences and technology capacity of UNESCO to assist member states address poverty eradication and sustainable development. Since the US will officially rejoin UNESCO on October 1, 2003, the US engineering community strongly supports such a program and is committed to play a central role in promoting and creating the conditions for sustainable development, security and peace.

Program activities will include hands-on advisory and training services, applied research, studies, publication of statistics, advocacy, curricula development, development of e learning for curriculum delivery and continuing education, conferences, expert meetings, fellowships, and partnerships with professional bodies, NGOs and private sector.

The proposed Program is for a period of at least 6 years, from 2004-2010, with possible extension. It will require at least three core professional and support staff complemented by seconded professional staff, consultants, fellows and interns. The Program budget is estimated at $2.5 million per year - $15 million over 6 years.

The program will augment the UNESCO work-plans and budget for 2002-2003 (31C/5) and particularly program proposals for 2004-2005 (32C/5). These initiatives will be executed through various activities. These include an "International Focus on Engineering, Technology and Poverty Eradication", proposed for later 2003, the second World Engineers" Convention, to be held in Shanghai in 2004, the Congress on "Engineering and the Megacities of the Future" scheduled for 2005, the "Budapest+5" follow-up activity to the 1999 World Conference on Science in 2004 and "Beijing+10" follow-up to the "Fourth World Conference on Women, Action for Equality, Development and Peace" in 2005.

The Program would be part of the Basic and Engineering Sciences Program of the Natural Sciences Sector of UNESCO and would actively develop linkages across all divisions including, culture, education and communications. In support of UNESCO's cross-discipline programs, particular attention would be given to sustainable development concerns in World Heritage Sites. The Program will be results-based and with an Advisory Board consisting of members of the international engineering and development communities.

The Program could be based at UNESCO headquarters in Paris or at another suitable location. Alternatively, following UNESCO policy for decentralization, the program could be located elsewhere to take advantage of proximity to international organizations, potential donor agencies and foundations, universities, professional organizations and NGOs.

For more information contact Michael Sanio: msanio@igc.org.

U.S. AID Promotes Global Village Energy Partnership

The Global Village Energy Partnership has been created because:

- Approximately 2 billion people are without electricity
- Women in some developing countries spend 1/3 of their productive life transporting wood
- Current activities do not link to broader energy needs in agriculture, water, telecom, small industry, health and education sectors
- Individual efforts to date have not been sufficient: weak political commitments and market barriers, insufficient number of enterprise,

Global Village Energy Partnership continued

(Continued from page 4)

not enough information and lesson sharing, inadequate financing, insufficient accountability for results
- Needs are beyond a single organization; require a partnership of organizations—public and private—to meet global energy service needs

The Partnership objectives are to:
- Catalyze country commitments to energy-poverty reduction in rural, peri-urban and urban areas
- Bridge the gap between investors, suppliers & users to mitigate barriers to energy access
- Facilitate policy and regulatory frameworks for scale-up to engage private sector & civil society
- Serve as a marketplace for lessons learned, best practices
- Crease and maintain effective coordination mechanisms among stakeholders
- Provide access to cleaner, more affordable energy sources for productive, social and consumptive uses including lighting, cooking and heating services

The desired outcomes of the Partnership include:
- 400 million people and 50,000 new communities served
- Significant number of countries with energy-poverty reduction programs
- Cadre of trained entrepreneurs
- Increases in productivity, incomes, environment, quality of life
- Implementation vehicle for Millennium Development Goals
- Large-scale replication of innovative, business, technical and financial energy models
- 10:1 leveraging of U.S. Government funding

The partners, 150- donor governments, developing countries, international organizations, industry, and civil society are asked to commit to:
- Increase energy access and reduce poverty
- 10-year "implementation-based and demand-driven" program
- Advance market principles: energy sector reform, diversity of energy providers and funders
- Consider multiple technologies, sectors & delivery approaches
- Focus on the poor
- Coordinate with related activities (national, local, regional) and partnerships
- Agree to report on results

For further information about the Global Village Energy Partnership visit Http://www.gvep.org

U.S. Water for the Poor Initiative Progressing

The United States announced an initiative to improve sustainable management of water resources at the World Summit on Sustainable Development (WSSD) in Johannesburg last August 2002. It will accelerate and expand international efforts to achieve the UN Millennium Development Goals and implement the Johannesburg Plan of Implementation including halving, by 2015, "the proportion of people who are unable to reach or afford safe drinking water," and the "proportion of people without access to basic sanitation." The U.S. will invest $970 million over three years (2003-2005). It is anticipated that these investments will mobilize a total amount of more than $1.6 billion for water related activities globally. Results to date have proven the effectiveness of the interventions undertaken by the initiative, and underscore the commitment of the United States in working with other government and non-governmental partners in three key areas:
- Access to clean water and sanitation services
- Improved watershed management
- Increasing the productivity of water

Enhancing Access to Clean Water and Sanitation Services

The United States will invest $510 million through USAID programs worldwide, concentrating on investments in countries where water authorities are undertaking the reforms necessary to enable viable partnerships that engage local governments, water utilities, the private sector, NGOs, communities and families.

For example in South Africa, USAID spends $6 million annually to provide sustainable water and sanitation services to municipalities through public-private and public-public partnerships. Fifty-three water and sanitation projects have been completed to date, and many of the recipients are the urban poor. USAID's Development Credit Authority (DCA) provided loan guarantees that enabled municipalities to finance high priority infrastructure projects for the provisions of water and sanitation to poor areas not being served or served inadequacies. This enabled the Vlakfontein Outfall Sewer District to initiate a $1.5 million project to provide sanitation to approximately 100,000 poor people previously lacking access. The Mission has begun discussions on a new facility.

In the Central Asian Republics, USAID has launched several activities in the water sector, including a large program on portable water in the Karakalpakstan region of Uzbekistan, an area hit hard by the Aral Sea Disaster. The

Water for the Poor Initiative continued

(Continued from page 5)
project will bring water to over 500,00 people in the region through new wells, purifying equipment, and delivery systems.

Improving Watershed Management

The United States is investing over $400 million over the next three years to integrate surface water, aquifer, and coastal zone issues to better manage water resources and to protect watersheds.

For example in Morocco, USAID has sent $30 million over the past ten years to promote improved water resources management in the Souss-Massa River Basin and in other important basins in the country. These activities have resulted in improved decentralized management of water resources through the formation of operational basin water authorities.

Increasing the Productivity of Water

The United States is investing $60 million over the next three years to ensure that agricultural and industrial water use is as productive as possible.

For example in Bangladesh, the $12 million Management of Aquatic Ecosystems through Community Husbandry (MACH) project encompasses a multi-disciplinary, multi-sector participatory process of planning and monitoring to enhance the productivity of fisheries and farmlands, so as to manage water resources in a more sustainable manner.

Since WSSD, USAID/Mali initiated a $10 million Irrigated Agriculture Development Program to support intensification and development of the irrigated agriculture sector, thereby increasing economic growth and alleviating poverty.

In Colombia, USAID helps farming communities adopt sustainable agriculture practices as an alternative means of income generation to help eliminate reliability on illicit coca production.

For further information visit http://www.usaidwater.org.

RAND Reports on S&T Capacity Building for Development

The Study

RAND completed a study on "USAID and Science and Capacity Building for Development" in December 2002 for the Bureau of Policy and Program Coordination at the U.S. Agency for International Development (USAID).

The objective of the study was to explore and think strategically about USAID's role in science and technology (S&T) capacity building. It explores the extent to which USAID has contributed to endogenous S&T capacity building and promoting innovations to advance economic growth. The study also examined ways to more fully optimize such contributions in the future. Three case studies representing a range of country conditions and S&T capacity levels were conducted: public health in Russia, energy in India, and agricultural research in Africa.

Today there is broad consensus that the S&T capacity gap is linked to the development gap. Having S&T capacity enables a society to sustain and proactively pursue its development goals and innovate to solve problems. Developing countries urgently need S&T, but most have limited capacity to absorb and adopt new knowledge and tools or to grow them at home to advance economic growth. Therefore, international cooperation is a critical means to meet their needs.

The major study findings are:

1. A more strategic approach could optimize USAID S&T investment and increase local capacity to sustain S&T capacity building and innovations.

2. Increasing S&T capacity building and innovation requires several actions, including top down changes in laws, policies, regulations and institutions, information dissemination; outreach; innovative financial marketing; and product warranty and performance schemes to spur adoption of new knowledge and tools.

3. There are significant challenges to S&T capacity building and innovation in developing countries, e.g., human and institutional S&T capacity is limited, financial resources are lacking, private sectors are often non-competitive, political will and table policies are lacking, and short-term needs often override long-term investment in S&T.

S&T capacity building is a long and cumulative process. Good governance at all levels is imperative and no single technology or S&T capacity building formula guarantees economic growth. Furthermore, the S&T policy of developing countries must focus on niches, locations, markets and priorities.

Developing countries would do well to exploit regional approaches, e.g., clusters and centers of excellence, to leverage existing resources, mechanisms, and comparative advantages. They must also build national innovation systems (NIS) that will effectively link S&T to economic growth.

The study concludes with several recommendations:

1. USAID (and others) must think strategically about building S&T capacity and innovation.

2. S&T capacity building and innovation must be closely tied to economic

RAND Report continued

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development to have a real impact.

3. It is critical to exploit opportunities in a multi-stage S&T capacity building process.

4. Generating innovations and moving them to the market is a dynamic and interactive process, and an effective NIS is necessary to support linkages in this process.

The study is available for reading on-line or can be downloaded at Http://www.rand.org/scitech/pubs/DRU2854.pdf.

This study has been published as a "Draft Report" to further solicit input from experts.

NSF Report on Complex Environmental Systems Available

At the May 9th meeting of the Engineers Forum on Sustainability Margaret Cavanaugh, National Science Foundation (NSF), presented the report "Complex Environmental Systems; Synthesis for Earth, Life, and Society in the 21st Century." This report is a 10 year outlook for the National Science Foundation, prepared by the NSF Advisory Committee for Environmental Research and Education.

The report notes that the global footprint of human activity continues to expand, environmental science and engineering problems will provide great challenges and opportunities in the next decade. Because of the complex relationships among people, ecosystems and the biosphere, human health and well being are closely linked to the integrity of local, national, and global security, health, and prosperity.

New instrumentation, data-handling, and methodological capabilities have expanded the horizons of what we can study and understand about the environment. These advances create the demand for collaborative teams of engineers and natural and social scientists that go beyond current disciplinary research and educational frameworks. Imagination, diversity, and the capacity to adapt quickly have become essential qualities for both institutions and individuals, not only to facilitate research, but also to ensure the immediate and broad-based application of research results related to the environment.

To meet these complex challenges as well as urgent human needs, we need to develop environmental synthesis to frame integrated interdisciplinary research questions and activities and to merge data, approaches, and ideas across spatial, temporal, and societal scales. An essential part of this process is the effective communication of scientific information, models, and conclusions to and among researchers, educators, students, resource and industrial managers, policy makers and the public.

To advance the fundamental knowledge necessary to address critical environmental challenges, the Advisory Committee for Environmental Research and Education recommends increased focus on three interrelated areas: a.) coupled human and natural systems, b.) couples biological and physical systems, and c.) people and technology Research in these areas is important, timely feasible, and likely to lead to significant scientific and practical outcomes in the next decade.

Coupled human and natural systems research explores the complex web of environmental relationships and feedbacks at diverse temporal and spatial scales. Research challenges include:

- Land, resources, and the built environment,
- Human health and the environment
- Freshwater resources, estuaries, and coastal environments, and
- Environmental services and valuations.

Coupled biological and physical systems research focuses on understanding the systems, processes and dynamics that shape the physical, chemical, and biological environmental form the molecular to the planetary scale. Research areas include:

- Biogeochemical cycles,
- Climate variability and change, and
- Biodiversity and ecosystem dynamics.

People and technology research seeks to discover new technologies that protect and improve the environment and also to understand how individuals and institutions interact with the environment, and how they use resources and respond to change. Research areas include:

- Materials and process development.
- Decision making and uncertainty, and
- Institutions and environmental systems.

To fulfil this research Outlook and to support a new generation of environmental professional, the Advisory Committee recommends major investments in environmental education, training, infrastructure, and technical capacity. Scientists, engineers, technicians, resource managers, and educators must be prepared to cross disciplines, integrate diverse information, and collaborate to solve environmental problems. Long-term, dynamic partnerships that cross national and regional jurisdictions and

NSF Report continued

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international boundaries can be the most effective means of addressing multi-scale challenges.

Environmental education should be used as an integrating concept in preschool, elementary, and secondary education, particularly when enhanced with teacher education and professional training programs. At two and four year colleges and research institutions, academic institutional structures and incentives should facilitate interdisciplinary environmental research, increased diversity in the environmental workforce, and productive interactions and policy makers and the community. Informal education about the environment through parks, museums, zoos, media, and citizen-scientist partnerships is also a critical component of enhancing public understanding of complex environmental information and decisions.

Infrastructure and technical capacity must also be expanded and strengthened to address the environmental challenges of the coming decade. As sensors, instruments, and observing systems continue to improve, and the quantity and quality of environmental data grow rapidly, cyber infrastructure must evolve quickly in order to achieve, integrate, interpret, and communicate environmental information. Interdisciplinary research also necessarily relies on experiments, models, and their interactions to understand environmental systems at multiple scales and to develop scenarios and projections that are relevant to policy and practice.

Copies of the Report are available by request from http://www.nsf.gov/ere.

Heinz Center Identifies Key Sustainability Indicators

In late 2002, the H. John Heinz III Center for Science, Economics, and Environment (the Heinz Center) released the report of its investigation into the status of the lands, waters, and living resources of the United States. The report, entitled, *The State of the Nation's Ecosystems*: *Measuring the Lands, Waters, and Living Resources of the United States* identifies a set of 103 key indicators of the condition and use of U.S. ecosystems and is the first in a series.

The goal of this project, whose target audiences include decision makers, opinion leaders and the public, is to have its indicators serve as the core around which the nation's environmental policies are debated., much as the core indicators of economic performance – such as unemployment, inflation, stock indices, and trade figures - serve as a core of well-accepted facts about conditions in the U.S. economy.

As described by the project director, Robin O'Malley, and two of his colleagues in an article, "Providing 'Better Data," published in the May 2003 issue of the magazine, *Environment*, "'*The State of the Nation's Ecosystems*' and the process by which it was produced were intended to achieve the three complementary goals of policy relevance, technical credibility, and political legitimacy" so that "the information will be useful in a broad policy arena and not itself be the subject of debate." In order to achieve these goals, the strategic outline of the report was developed by a Design Committee, a group of individuals at senior levels in corporations, trade groups, environmental organizations, government, and academia, while the selection of indicators, evaluation of data sources, and initial report drafting were undertaken by several technical working groups, one for each of the principal ecosystem types around which the report is organized, i.e. coasts and oceans, farmlands, forests, freshwater, grasslands and shrublands, and urban and suburban areas. The report includes 18 or fewer indicators for each of these ecosystem types and a set of 10 core national indicators that describe the nation as a whole.

As outlined in *Environment*, the decisions taken by the report's Design Committee can be summarized into six key points: (1) the report should be strategic, not encyclopedic, in order to communicate vital information concisely to busy decision makers and opinion leaders; (2) the indicators should be described in as neutral a fashion as possible to provide information that would be accepted as valid by as many parties in the environmental policy scene as possible; (3) the report should identify not only those indicators for which data currently exist but also important indicators for which national data are not presently available, in order to identify gaps and encourage actions to fill those gaps; (4) the report should be written in language that is accessible to non-specialists to provide descriptions that are concise and understandable yet technically accurate; (5) the report should include information on both the condition of ecosystems and the goods and services that people derive from them; and (6) the report should focus on the state of ecosystems, as contrasted with reporting on the stresses or pressures that might be changing ecosystems, or on the policies or actions of government or private parties.

According to *Environment*, "'*The State of the Nation's Ecosystems* 'was envisioned as a vehicle to bring information across a key boundary – between science and policy making," and the most important of the decisions essential to the success of the report was "the decision not to attempt to resolve contentious policy issues or unresolved scientific issues of cause and effect." This choice was made "with the explicit goal of ensuring the long-term political

Heinz Center continued

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viability of an ecosystem reporting effort and so was designed to limit discussions to areas in which it was believed agreement" was reasonably achievable.

As stated in *Environment*, a key lesson from the Heinz Center report "is that careful, thoughtful attention to the relevance, credibility, and legitimacy of both products designed to inform the environmental policy debate and the processes by which these products are developed is crucial to their ultimate success."

For further information about *The State of the Nation's Ecosystems* and the work of the Heinz Center, see the Center's web site: http:www.heinzctr.org or call 202-737-6307.

Georgia Tech Marks Progress in Sustainability Education

At the May, 2003 meeting of the Engineers Forum on Sustainability, Dr. Jorge Vanegas of Georgia Tech reviewed the progress of the Institute in providing leadership in sustainability education over the past decade.

In 1993, a Center for Sustainable Technology (CST) was established, and the General Electric Fund provided almost one million dollars to create a curriculum on sustainable technology and development. An Institute-wide Sustainability Task Force was organized, and a three course sequence was developed and deployed.

Today at Georgia Tech, sustainability is central to both the Institute's vision and the Campus Master Plan. The CST has become the Institute for Sustainable Technology and Development (ISTD). Sustainability has been integrated throughout multiple academic and research programs, with nearly 20 affiliate centers and laboratories doing sustainability-related research. Georgia Tech itself has become a living laboratory for sustainability.

The programs and activities of the ISTD can be summarized as follows:

Course Inventory and Research Directory - ISTD has created a comprehensive inventory of courses with sustainability content and a directory of Georgia Tech researchers active in the areas of sustainable development and technology.

Sustainable Technology and Development Certificate - ISTD is pursuing approval of an undergraduate certificate program in Sustainable Technology and Development.

Green Mapping of GT Campus - ISTD has partnered with Green Maps International to provide a "Green Map" of the Georgia Tech campus. Visits to different "green" sites on the map provide a unique opportunity for student involvement.

Energy Conservation Competition - ISTD Staff has developed an introductory energy conservation competition, to be implemented in two GT dormitories this year.

DuPree College of Management Sustainability Retreat - ISTD helped plan and host a retreat for key faculty members at the College, to explore how sustainability can be incorporated into research, education, and outreach.

Green Purchasing Guide - ISTD completed a Green Purchasing Guide in order to ensure Georgia Tech compliance with recycled content purchase legislation from the State.

The Center for Sustainable Urban Revitalization (CSUR), the newest center at Georgia Tech working on sustainability, plans to use the Atlanta Metropolitan Region as a living laboratory. CSUR will: 1) integrate distinct areas of expertise in land-use planning, environmental science and engineering, sustainable design and construction, energy systems, legal and policy issues, and economic development; and 2) provide a unique, holistic program that facilitates the transfer of university-based knowledge, experience, and technologies to urban development stakeholders to promote sustainability principles.

Through active collaboration and partnerships within Georgia Tech, and with other national and international organizations, the Institute plans to target the complete education pipeline, from K-12 education, through undergraduate, graduate and doctoral studies education, to continuing education for professionals and the general public.

For further information, contact jvanegas@ce.gatech.edu

New MBA Program Promotes Sustainable Management

Presidio World College, an Affiliate of Alliant International University, has announced a new MBA program designed to prepare professionals to position their organizations as leaders in the practice of sustainable management. The new program emphasizes positive social and environmental business practices as drivers for bottom-line growth.

Throughout the two-year program, students learn how to integrate ethical, social, and environmental values with decision-making skills in business. Students are taught basic business skills such as managerial accounting, finance, and operations, with special attention paid to companies who are implementing sustainability initiatives in their organizations. Required courses also include 'The Principles of Sustainable Management: and "Culture, Values and Ethics in Global Society."

The corporate social responsibility movement is growing rapidly at top universities across the country. The Haas School of Business at U.C. Berkeley has created the Center for Responsible Business, Stanford Business School has the Center for Social Innovation, and The Tuck School of Business at Dartmouth has just begun the Initiative for Corporate Citizenship.

In addition to administrative initiatives, student-led Net-Impact, a non-profit organization for MBA students dedicated to using the power of business to improve the world, has grown to over 5,000 members with chapters in 75 leading business schools.

NCSE Reports on Education for Sustainability

Education for sustainability must be infused across the educational enterprise for lifelong learning, according to a new report from the National Council for Science and the Environment (NCSE). Recommendations for Education for a Sustainable and Secure Future presents a national agenda for education that links sustainability and security, based on the recommendations of more than 800 educators, scientists, decision-makers, and other citizens at the 3rd National Conference on Science, Policy and the Environment held earlier this year.

The recommendations in the report collectively form an educational agenda for the United States and for the UN Decade of Education for Sustainable Development, slated to begin 1n 2005. They revolve around the central tenet that a new approach to education is essential to simultaneously protect and provide for economic and personal well-being, which together form the foundation for human and global security.

The recommendations address five critical needs for improving education for sustainability:

- Identify sustainability education needs and practices
- Develop sustainability education standards and programs
- Facilitate the teaching of sustainability concepts
- Communicate sustainability concepts to the public
- Foster business leadership of sustainable practices

According to the report, sustainability should not be viewed as a separate field of study, but rather an approach to understanding that is integrated across the curriculum, including formal education in elementary and secondary schools, colleges, and business and other professional schools, as well as community and public education. Schools, businesses, agencies and other organizations must become leaders in "practicing what we teach" through adopting sustainable practices and creating sustainable facilities (such as making every school a solar school, balancing their carbon budget, and finding other ways to minimize their ecological footprint on the planet). There is great potential to integrate practice into education - learning by doing.

However, many educators and educational institutions are not yet prepared to implement education for sustainability. Baseline information about the status of sustainability education and practice in any nation is largely absent. Criteria to measure success must be developed and implemented. Education about sustainability concepts must be linked to their use and application in business and in people's lives. The gap between education and practice is often wide. Despite good intentions, there are many barriers to education for sustainability, ranging from narrow thinking to narrow budgets.

Further information on the report and NCSE can be found at Http://www.NCSEonline.org

7th Annual Green Chemistry and Engineering Conference Held in June

The 7th Annual Green Chemistry and Engineering Conference, held June 23-26 in Washington, DC, combined science and policy in addressing the theme *Green Chemistry and Engineering: Integrating Sustainability, Safety, and Security*. The Conference focused on the role of green chemistry and engineering in achieving a safe, secure, and sustainable society. Technical and policy experts discussed green chemistry and engineering in the context of accident prevention, sustainability and chemical site security. Technical presentations in alternative solvents, catalysis, and benign synthesis and processing considered the environmental, economic, and social benefits of greener technologies, particularly as they relate to the theme of the Conference.

The Conference, hosted by the Green Chemistry Institute and the American Chemical Society, opened on June 23rd with the presentation of the Presidential Green Chemistry Challenge Awards. The Presidential Green Chemistry Challenge 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. EPA's Office of Pollution Prevention and Toxics is leading this voluntary partnership program with other EPA offices, federal agencies, members of the chemical industry, trade associations, scientific organizations, and academia.

Green chemistry and green engineering focus on the design, development and implementation of chemical processes and products that reduce or eliminate the use and generation of hazardous substances in a way that is both feasible and economically viable. Green chemistry and engineering are important tools in preventing pollution at the source and in providing solutions to long-term global challenges.

For more information visit the ACS Green Chemistry Institute web site:

http://chemistry.org/portal/a/c/s/1/acsdisplay.html?DOC=greenchemistryinstitute\index.html.

Commuter Connections Offers a Smarter Way to Work

Commuter Connections provides free services to commuters in the Washington DC metropolitan region who are interested in commuting by alternative modes in order to reduce congestion and air pollution. These modes include carpooling, vanpooling, using transit, teleworking, cycling and even walking to work. In order to encourage more commuters to give up driving alone, they offer two FREE benefits,- Matchlists and Guaranteed Ride Home.

Matchlists list all the options available to commuters that match their route and schedule, including local telework centers.

Guaranteed Ride Home (GRH) benefits are offered to commuters who rideshare at least twice a week. With this benefit, a commuter will receive up to four free rides home by rental car, taxi, or transit for unexpected emergencies such as personal or family illness, and unscheduled overtime with supervisor's verification. Commuters are encouraged to pre-register for GRH once they start ridesharing.

Commuter Connections was founded was founded in 1974 due to the gas crisis and it is a public service offered free to commuters and employers in the metropolitan area.

Free services include: ride-matching, Guaranteed Ride Home benefits, vanpool subsidy information, information on teleworking, park and ride maps, transit information, and bike to work guides for employers and employees.

Commuter Connections has a network of employer outreach representatives in every county in the metropolitan region ready to assist employers in adopting transportation benefits, at no cost.

Commuter Connections also provides employers with free surveys to find out from where their employees are commuting, in order to assist with relocations, recruitment, and retention.

Commuter Statistics

- Currently there are 16,000 commuters registered in the Commuter Connections rideshare database, up from 4,500 in 1997.
- There are 2.25 million commuters in the Washington metro area, and over 600,000 commuters use alternative modes daily.
- Teleworking is the fastest growing alternative to driving alone to work
- Over 15% of the region's commuters choose to carpool to work
- Each week, Commuter Connections receives an average of 750 calls from commuters interested in ridesharing and Guaranteed Ride Home.

Cost Savings

The average commuter who rideshares saves over $1,200 a year on commuting costs. Ridesharing cuts down on parking, maintenance, and gasoline costs.

Additional information on Commuter Connections can be found at Http://www.commuterconnections.org.

The San Destin Declaration of Green Engineering Principles

Hank Hatch and Al Grant

Green Engineering transforms existing engineering disciplines and practices to those that lead to sustainability. Green Engineering incorporates development and implementation of products, processes, and systems that meet technical and cost objectives while protecting human health and welfare and elevating the protection of the biosphere as a criterion in engineering solutions.

To fully implement green engineering solutions, engineers us the following principles:

1. Engineer processes and products holistically using systems thinking, and environmental impact assessment tools.
2. Conserve and improve ecosystems and human health and well-being.
3. Use life cycle thinking in all engineering activities.
4. Endure that all material and energy inputs and outputs are as inherently safe and benign as possible.
5. Minimize depletion of natural resources.
6. Strive to prevent waste.
7. Develop and apply engineering solutions, being cognizant of local geography, aspirations and cultures.
8. Do not be limited by current or dominant technologies; seek fundamental and incremental change.
9. Create awareness in and engage communities and stakeholders.

There is a duty to inform society of the practice of green engineering.

This declaration was complied through the discussions of approximately 65 engineers and scientists during the week of May 19, 2003 at the San Destin Conference on Green Engineering, sponsored by Engineering Conferences International. This declaration represents a consensus view of the principles of green engineering as determined during these deliberations a, and should not be construed as the individual opinions of any of the participants or sponsors.

RNRF to Address Crisis in Natural Resources Management

The Renewable National Resources Foundation (RNRF) has scheduled a "Conference on Personnel Trends, Education Policy and Evolving Roles of Federal and States Natural Resources Agencies." The conference is being presented in association with the American Association for the Advancement of Science (AAA), and will convene at its headquarters in Washington, DC, October 28-29, 2003.

Recent statistics reveal a looming crisis in the management of natural resources. Across the federal government, about 30 percent of the 1.6 millions full-time employees will be eligible to retire within five years. An additional 210 percent could seek early retirement. Meanwhile, the agencies charged with managing and protecting natural resources face similar prospects. At the EPA, a third of the senior executives are 50 to 54, with another third older than that. At the Bureau of Land Management, 35 percent of the 8,700 employees are eligible for retirement within in the next seven years.

This emerging crisis is not limited to the federal government. The Council of State Governments warns, "Estimates show that state governments could loses more than 30 percent of their workforce by 2006… several factors combine with current labor conditions to foreshadow a crisis. These factors are: the rate of employee retirement, the composition of the current state workforce, and budget problems."

Thus, the combination of workforce demographic trends—and more that a decade of budget cutting and reductions in forces—raise serious questions about the continuing role of government in managing our natural resources. Traditional leadership responsibilities are changing by design and by default. The professional and scientific communities—and related educational institutions—have an opportunity and an obligation to evaluate and communicate the consequences of the present course. The conference will provide an interdisciplinary forum to examine these trends and their impacts on the agencies, resources, and affected professions.

For further information on the conference, contact RNRF:
Http://www.rnrf.org
Tel + 301-493-9101.

Upcoming Meetings

Engineers without Borders – USA
National Conference
October 4-5, 2003
Http://www.ewb-usa.org

Sustainability & Life Cycle Conference
AIChE Fall Meeting
November 16-21, 2003
Http://www.aiche.org/conferences

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For more information on the three societies sponsoring this newsletter please visit their web sites:

ASCE: http://www.asce.org
American Society of Civil Engineers

ASEE: http://www.asee.org
American Society for
Engineering Education

AIChE: http://www.aiche.org
American Institute of Chemical Engineers