

“BEYOND THE INTERNET”

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INTRODUCTION

I wish to congratulate Kamel Ayadi, the government of Tunisia, and others who made this conference possible.

I must confess that I am not an expert in the emerging information and communication technologies (ICT's). At my age, I am barely able to get on the Internet and can use only a small amount of software.

Instead, I bring some concepts based on more than 50 years experience working on engineering projects in more than 20 countries. I am also incorporating some recent experience gained from professional societies such as WFEO and my role as past-president of the World Engineering Partnership for Sustainable Development (WEPSD).

Many of the concepts in this report were originally presented last year in the WFEO report, "*Engineers and Sustainable Development*". (I will have a few copies of this report with me at the conference.)

WFEO AND THE DIGITAL DIVIDE

Currently, I am President of the WFEO Committee on Technology (ComTech), one of four standing committees that are responsible for most of WFEO's work. The primary goal of ComTech is to assist in the transfer of practical knowledge to developing countries that will help them meet their basic needs while protecting the natural environment.

The other three standing committees are:

- **Committee on Information and Communications (CIC), the hosts of this conference.**
- **Committee on Engineering and Environment (CEE)**
- **Committee on Education and Training (CET)**

Each of these committees is composed of national members from both developed and developing nations. As mentioned by our President Jose Medem, WFEO was founded in 1968 under the auspices of UNESCO. WFEO brings together engineering organizations from 80 countries and represents at least 10 million engineers. WFEO is the largest global engineering organization.

Each of the four standing committees is vitally concerned about the need to bridge the digital divide and to open effective means of communicating with engineers everywhere. However, we all face several problems. Let me explain.

- The total budget of WFEO is less than \$ 200,000 (or about two pennies for each of the World's engineers). This budget is augmented by contributions from the countries that host the four standing committees and sponsor its members. In addition, most of our volunteers donate their time; some pay most, if not all, of their own expenses. So, our first problem is financial.
- At the WFEO General Assembly in 2001, VP James Poirot expressed his concern about lack of effective communications between WFEO members and engineers in many countries. Poirot stated that we have a limited ability to provide helpful information to engineers at local levels or at the grass roots of developing countries. He cited many causes, other than lack of funding, such as the different languages, multiple cultures, lack of access to the Internet, political and legal differences and other reasons.
- In response to Poirot's challenge, ComTech drafted a comprehensive program aimed at providing engineers everywhere with the knowledge and other assistance they need to improve their country's living standards and environmental management.
- The purpose of this presentation is to outline a modified global program that would go "beyond the Internet". With enough time and money, the digital divide can be solved. But I believe a more fundamental program is also needed, one that is custom-made to meet the needs of each developing country.

BASIC ASSUMPTIONS

1. The information and communications technologies (ICT's) are emerging with breathtaking speed. In addition, valuable programs such as virtual libraries, such as VELSD, virtual universities, and communication programs such as SANet are evolving rapidly.
2. Overcoming the digital divide can be compared to building a super-efficient pipeline for the transfer of data and information. Soon, this pipeline will become larger, faster, cheaper and widely available. An increasing reservoir of data and information will be created to flow through this pipeline. I believe that a unified

or consistent system needs to be developed in building this pipeline and its contents to reduce confusion and overlap. This suggests the potential need for a coordinated **TOP DOWN PROGRAM** to create greater efficiency and to reduce duplication in the use of ICT's.

But will the flow of data and information from this pipeline be really useful to engineers and others at remote locations in developing countries?

3. In December of 2002, several of us attended a workshop of the SANet Board of External Advisors in Paris. This workshop discussed the applications of SANet, the Development Gateway and other approaches to improve communications with developing nations. One of the speakers was Professor Jose Santos of Portugal. His presentation was on "*Managing Dispersed Knowledge*". His major points can be restated as follows:
 - Early in human history, knowledge was passed on by small groups of people, living close together. Information and accumulated experience was shared easily, person to person.
 - As communication systems improved, individuals at remote locations could share information and knowledge effectively, **providing they had a similar background and were living in a comparable environment.**
 - Today, we are trying to develop ways to assist people at remote locations, living under far different conditions than individuals in hi-tech industrialized nations. Providing effective assistance to developing nations must overcome many handicaps. These include language differences, religious and cultural barriers, economic problems, political and legal conditions, varying physical environments and a host of other factors. Conditions can vary dramatically even within a single country.
 - Professor Santos argued that the Internet can be useful in transferring **data and information.** However, he said it cannot be used to transfer **knowledge** effectively where people at a village level are living under far different conditions than the senders of information. To convert data and information to useful knowledge would require several steps:
 1. The creation of knowledge through experience and innovation.
 2. The transfer of knowledge to the potential users.
 3. The conversion or adaptation of knowledge in a manner that can be interpreted in a different context at remote locations.

4. The use of this appropriate knowledge in a manner than can be modified, and maintained, by users in developing nations.

Bridging the digital divide for developing countries should be matched by a second program. This would systematically analyze the unique needs for each country for many kinds of assistance, then solve these needs, step by step, over a ten-year period.

*Improved access to modern communication systems will help, but a **BOTTOM UP PROGRAM** is also needed to identify and provide other forms of assistance to each developing country.*

RECOMMENDED FIVE-PART PROGRAM

OBJECTIVES:

- Investigate the extent of engineering networks and organizations in each developing country; establish contacts with key individuals in national and local engineering societies.
- Develop background information about each developing nation. Investigate and evaluate the needs for sustainable technology and other forms of assistance for each country.
- Analyze and summarize existing communication networks and programs that can be used, or developed, for gathering and sharing information on sustainable technologies. Summarize existing and future programs that might be used for training and capacity building, including hands-on assistance on projects.
- Evaluate and prioritize approaches that seem best suited to help individual countries to meet their most pressing needs. These approaches must include gaining cooperation with key stakeholders and increasing the capacity of local participants to build and manage projects.
- Plan, fund and coordinate a 10-year program designed to help engineers and others meet the unique needs of each country in executing sustainable programs and projects.

The approaches that could be used in achieving these five objectives are outlined in a five-phased program. While the five-phased program might take 10 years or more to accomplish, it could be tested by pilot programs very quickly. Then, the long-range program could be modified based on the results of these initial efforts.

PHASE 1-INVESTIGATE EXISTING ENGINEERING ORGANIZATIONS

- Existing information should be gathered and summarized on the organizational structure, scope of activities and potential contacts for engineering societies, universities and consulting engineering firms in each country. This would be based on information obtained from the membership of WFEO, FIDIC, UATI, ICET, national academies of engineering and other available sources.
- Then a task committee should be formed, composed of representatives of WFEO, FIDIC and other interested NGO's. The task committee should communicate with the representatives of the local and national engineering organizations identified in the first step. This would be supplemented by visits to identified contacts in developing countries. The primary purpose of these visits would be to recruit one or more volunteers in each country who would be willing to act as the focal point for further communications regarding the needs for sustainable technology and capacity building.
- As a product of this research, it is hoped that a person-to-person communications network can be established to assist in carrying out the balance of this program. This network would augment and supplement the ongoing activities of WFEO, FIDIC and other engineering organizations. The network should include a web-site where current information could be stored and shared.
- The results of this preliminary investigation should be summarized in a report that would be published electronically and in hard copy.

PHASE 2-DETERMINE AND EVALUATE EXISTING AND FUTURE NEEDS

- Background information should be developed for each country. This would include information on the history, language, religion, culture, economy, population density, levels of education, government, legal system and any other variables that could assist or impede the goals of this program. This information could be obtained from published sources and from interviews with personnel with organizations such as the UN or the World Bank.
- The communications network, established in phase 1, should be used to identify the existing and future needs for sustainable technology, training, and capacity building in each country.
- A comprehensive questionnaire could be prepared for each country to gather information from the country's engineering societies, consulting engineers and engineering universities. This survey would include, but not be limited to, the following:

- ✓ What are the most important issues or problems, if any, in meeting basic human needs and protecting the natural environment?
 - ✓ Availability and costs of accessing the Internet by telephone lines or wireless connections?
 - ✓ Availability of computers and software?
 - ✓ Need for training facilities and reference materials?
 - ✓ Extent of knowledge transfer programs within the country that could be expanded early in pilot programs?
 - ✓ Capacity of local consulting firms to team with consulting firms from other countries?
 - ✓ Access to advisors and/or mentors that can be used to review projects and serve on project review boards?
 - ✓ Assistance needed, if any, in getting funding for needed projects?
 - ✓ Interest in using volunteers from other countries to provide hands-on help?
 - ✓ Assistance needed in getting cooperation from government agencies and other stakeholders?
- The results of this survey should be summarized and evaluated for each country. A draft of the survey results would then be transmitted back to each country to verify that the information has been summarized accurately. A report should be prepared for this second phase of the program. The report would include recommendations for any changes in the scope and budget for subsequent phases.

PHASE 3—INVESTIGATE AND EVALUATE EXISTING AND FUTURE PROGRAMS FOR SHARING SUSTAINABLE TECHNOLOGIES AND CAPACITY BUILDING.

- Existing and/or emerging communications networks should be identified that could be used or modified to share sustainable technologies and other purposes.
- Sources of relevant reference materials that could be used or expanded for engineers in developing countries should be summarized.
- Training programs that incorporate practices of sustainable development should be evaluated. In particular, it would be important to summarize programs that could be used in long-distance teaching and by virtual universities.
- Case histories that demonstrate the use of appropriate technology in meeting human needs should be summarized. Many of these case histories may result from innovations originating from developing nations.

- **Current and planned efforts to develop design and construction guidelines need to be reviewed. These guidelines should demonstrate to engineers how to incorporate the principles of sustainable development in engineering projects.**
- **Examples of volunteer organizations need to be summarized, such as Engineers Without Borders and the Water for People Program. Some of these organizations now provide low-cost help in assisting local villages in meeting their basic needs. (Examples of such hands-on programs will be illustrated at the conference.)**
- **Efforts are needed to identify programs by donors or financial institutions that foster the teaming of engineers in developing countries with engineering firms from developed countries.**
- **Other programs may need to be developed or expanded in the future. These could include:**
 - ✓ **Publication of comprehensive guidelines on how engineering can be applied to meet basic human needs with simple, adaptable technology. Such guidelines should include success stories and case histories.**
 - ✓ **The establishment of Regional Sustainable Development Centers that could be used by scientists and engineers willing to help overcome poverty, health or environmental problems. These centers could be used for training local engineers and for planning potential projects.**
 - ✓ **Expanded use of volunteer groups that would be available to provide advice or assistance on projects. This could include enabling Engineers Without Borders (EWB), and similar organizations, to function on a broader basis. Volunteer programs could be expanded to include assistance in agriculture, transportation, energy development, and other fields. The volunteer groups could include retired engineers at one extreme and a new “Youth Corps” that would work along side local engineers and villagers in developing countries. Perhaps this could be augmented by a board of global advisors that would provide advice on a broad range of issues electronically or by site visits during planning or construction of projects.**
 - ✓ **Publication of a comprehensive summary of low-tech innovative approaches that have been used to solve problems at the village level in developing countries. This should include the many innovations that have been created in developing nations. The summary should include an analysis of the advantages, disadvantages and limitations of existing appropriate technologies.**

The results of this study should be summarized in a report, which would be updated annually. This would summarize and evaluate ways by which the local needs of developing countries could be met, considering existing and future activities. Based on the results of this phase, it may be necessary to revise the scope of the remaining phases of this program.

PHASE 4—DEVELOPMENT OF A MASTER PLAN TO ASSIST DEVELOPING COUNTRIES.

- **The information gained in Phases 1, 2, and 3 should be used to develop short- and longer-range programs that would assist developing countries in a systematic manner.**
- **Pilot programs might be started immediately for those countries where significant benefits could be achieved with modest costs.**
- **Priorities should be set for the remaining assistance programs, using acceptable criteria that need to be developed.**
- **Program plans and budgets should be prepared for the countries in greatest need of assistance. These plans should consider what might be done quickly, at low cost, as well as activities that might take 10 or more years to accomplish.**
- **The master plan should be reviewed annually.**

PHASE 5- FUNDING AND MANAGING ASSISTANCE PROGRAMS

- **The first four phases of this program could be managed by the World Federation of Engineering Organizations (WFEO) working in close collaboration with the International Federation of Consulting Engineers (FIDIC) and other international engineering groups. Leading universities might be involved in gathering country-specific data. The funding for the first four phases might come from a single source such as the Global Environmental Facility (GEF), the World Bank, UNESCO or an existing private foundation.**
- **The plans developed in the first four phases of this program should be reviewed by a global board of advisors. This board might include respected engineering leaders, representatives of international agencies, financial institutions and respected NGO's. This review might take place through one or more special conferences.**
- **The costs of carrying out a 10-year master plan to assist developing countries may be 10 to 100 times greater than the first four phases of this program. For this reason, it would be important to seek funding on a continuing basis from a permanent team of donors.**

- A permanent “Consortium of Donors” might be established to review, fund and manage long term projects. Such a consortium might be patterned after the “Consultative Group on International Agricultural Research” (CGIAR). This is an association of public and private organizations that supports strategic and applied agricultural research in 100 countries. The CGIAR partnership includes 22 developing and 21 industrialized nations, 3 private foundations, and 12 regional and international organizations that provide financing, technical support and strategic direction. Each year, CGIAR reviews the progress going on at many locations, reviews future budgets, and coordinates the funding for multiple programs.
- The concepts contained in this paper should be discussed with a variety of possible funding sources. Perhaps a simpler approach could be used than to create a “Consortium of Donors”. However, I believe that the planning and funding of assistance projects for developing nations warrants international coordination. These projects should consider the unique challenges and needs facing each country.

SUMMARY

In the future, engineers can, and will, play an important role in helping developing nations to overcome problems of the multi-faceted causes of poverty and improve public health while reducing environmental problems.

Most of the problems in developing nations can be solved by adapting existing knowledge and experience.

Overcoming the digital divide would represent a major step forward in helping to improve living standards and environmental management. To reduce confusion and duplication of efforts, the systems used in developing new information and communications technology (ICT's) should be uniform and consistent to the extent possible.

However, improved access to data and information is not enough. ICT's need to be matched by a more basic approach based on the unique needs of each country. A global program should be planned to analyze these needs. Then, a new approach may be needed to coordinate the funding and management of funding programs over a ten-year period.

WFEO can provide the leadership for developing this supplemental program with the assistance of other engineering groups, international donors, and appropriate NGO's. It is hoped that this presentation will provoke further thought and actions that go “beyond the Internet”.

