# RECOMMENDATIONS OF THE MEETING

Addressing some of the most pressing and highly debated issues and challenges of the developing world, the meeting on 'Science and Technology Capacity Building for Sustainable Development' was held from 19 to 21 February 2003, in Islamabad. The meeting remained a fruitful endeavor with comprehensive and implementable recommendations coming out of the five technical sessions, spread over three days. The technical sessions were based on the lines of: i) Industry and Engineering, ii) Human Resource Development, iii) Geology and Engineering, iv) Information Technology and finally v) Agriculture. The active participation of leading scientists, eminent technologists, industrialists, engineers, agriculturalists, IT professionals, development consultants, economic analysts, educationists and other qualified experts and professionals from COMSATS' member countries and beyond, was exemplary during the event. The presentations of expert speakers from these diverse fields and professions have resulted in the following recommendations, which are expected to serve as important building blocks for the future sustained S&T capacity building policy framework of Pakistan and other developing countries:

## EMPHASIZE DEVELOPMENT AND CAPACITY BUILDING IN THE ENGINEERING AND INDUSTRIAL SECTORS

Global Free Trade and resultant stringent competition is posing a serious threat to the survival of the local industry of developing countries. The consequent need for the future sustainability of the industry is to foster development of competitive industries, create employment, generate income and thus contribute to the alleviation of poverty, illiteracy and all kinds of social hardships. The focus needs to be on the creation of employment, on higher value-added products and increased competitiveness in export markets, as well as the improvement in institutional capacities and capabilities for environmental, energy and product quality management. This whole system that covers the perspectives of sustainable development needs to be executed in a precise and appropriate manner. This would require continuous monitoring and feedback, which is crucial for any mid-course correcting action. It is therefore suggested that the public and private sector:

- Implement international agreements, primarily the Montreal Protocol, the UN Framework Convention on Climate Change and the Basel Convention;
- Develop ISO 14000 environmental management systems certification schemes;
- Create awareness of national and international best-practices in the fields of technology, management-systems, and policy;
- Improve the understanding of sustainable development and, in particular, the business opportunities that sustainable development presents in Pakistan;
- Encourage industry, government and community-organizations to adopt initiatives that result in the improved use of eco-efficiency and cleaner production among their constituencies;
- Build common demonstration effluent-treatment plants for the textile and leather industry;
- Implement industrial policies that provide an enabling framework, within which the private industrial sector can operate with full efficiency and competitiveness;
- Raise awareness of potential foreign investors and technology-suppliers of investment opportunities
- Develop strategies and related institutional framework to enhance the development of more efficient and competitive small and medium-scale industries;
- Encourage the formation of industrial clusters that provide cost-effective access to highly specialized economic inputs;
- Increase the output of agro-based industries (food, textile and leather processing industries) by modernization and build support for the development of such industries;
- Identify the managerial and technical skills needed to expand specific industrial sub sectors.
- Formulate an environmental strategy that sets risk-based pollution-reduction targets and realistic time-frames for compliance;
- Build national capabilities for development of energy-management systems; promote renewable energy by introducing clean and new technologies;

- Develop human resources in the field of industrial energy efficiency;
- Develop and implement energy-saving, co-generation and recovery systems in selected industries and demonstration plants;
- Assist development of environmental regulations and transfer of advanced environmental practices for management of large cities;
- Assist development of environmental monitoring and pollution-control systems in the private sector.
- Advise industry on the best combination of pollution-prevention and abatement options that would mitigate environmental problems;
- Offer training programs that expand the availability of technical, managerial and entrepreneurial skills.
- Create a cadre of highly qualified professionals, so that they can perform functions related to technology-promotion;
- Encourage women entrepreneurs in industry, with a combination of training and consultancy services;
- Promote innovative and appropriate technologies for commercial applications in specific manufacturing branches.

**MAINTAIN STRATEGIC FOCUS OF RAPID INDUSTRIALIZATION AND ECONOMIC GROWTH ON INDIGENIZATION IN THE ENGINEERING INDUSTRY**

It was proposed that a change in the government policies towards industrialization, developing human resources, encouraging growth through market enhancement, developing industries with global perspective, rationalizing institutional and regulatory frameworks is essential. The recommendations for achieving these objectives are as follows:

- Government policies should be driven by national interest, supporting local industry without seriously infringing on WTO and other international commitments;
- Government should avoid fragmented decision-making and follow an integrated approach, with various policies complimenting and not contradicting each other;
- Allocation for higher education should be extended for Technical Manpower Training, through allocation of at least 1% of the total annual outlay to technical education and skill-development for the next five years;
- The entire government machinery should support procurement of Engineering Products and award of contracts to local companies;
- Aggressive promotion should be made to attract relocation of industries from industrialized countries;
- Governments should take comprehensive initiatives to make themselves a member of the global supply-chain;
- Expedite enactment of effective repossession laws to further encourage leasing;
- Offer State-Credit for exports of capital goods;
- Rationalization of tax and tariff regimes carried should be continued, to provide protection and level playing-field, including withdrawal of exemptions detrimental to the local industry.

**STRIKE THE RIGHT BALANCE BETWEEN EFFORTS OF DONOR AGENCIES AND RECIPIENT COUNTRIES IN ORDER TO ACHIEVE SUSTAINABILITY**

It was appreciated that despite enormous efforts, investment and contribution of developing agencies for the development of a country, development has not taken place as expected by the donor agencies and likewise the expectation of the recipient country remains unfulfilled as well. The recommendations received in this regard, called for the donor agencies to have a partnership approach for execution of development programs – programs having multi-dimension support with duplication of efforts being avoided by joining forces with other development agencies. Furthermore, the evaluation mechanism for monitoring the progress was recommended to be fine tuned. It was suggested that the donor/development agencies operating across the globe should undertake differentiated strategies to address the local needs.

For the recipient countries it was suggested that they should focus on building research capacity in the long run for self-sustenance, undertake projects suiting local needs in a professional and result-oriented fashion through comprehensive planning and analysis. The problem identification phase needs to be strengthened so that once a development agency undertakes a particular program, the desired results are achieved. While receiving aid to eliminate

development problems, the recipient countries should make appropriate policies for a consistent application of the strategy-network that they devise. Those firm policies and rules surely can provide a balance and organization of development-programs and would optimize the use of external help.

## UTILIZE ADVANCED TECHNOLOGIES FOR SUSTAINABLE DEVELOPMENT

The meeting emphasized rapid industrialization, export enhancement, self-reliance and minimization of imports for a strengthened economy. In this regard, the focus should be on:

- Enhancement of import-substitution and export of value added products;
- New and emerging technologies in the fields of transport, automation, industrial production, communication, bio-medics, diagnostics of all kinds, avionics and space travel, etc;
- Up-gradation and improvement of overall technological set up;
- Improvement in technical skill and know-how of sector specific manpower;
- R&D input pertaining to material technology for the local production and development of advanced materials.

## REALIZE AND UNDERSTAND THE REQUISITES AND DYNAMICS OF PRESENT DAY R&D

The meeting took stock of the changing dynamics and trends for research and development and recommended the following initiatives for commercialization of R&D, which is the need of the hour:

- A mechanism of implementation based on the so-called Third Generation R&D for extending a variety of technical services should be installed;
- Developing technology business incubators that are long-term, capital intensive, real-estate driven investments, which take advantage of proximity to sources of intellectual capital and sound infrastructure, to promote scientific research and its utilization;
- Governments should develop supportive policies and business-infrastructure, while private agencies provide the actual training, counseling, information, networking and related services in a business-like manner;
- Sustainability of R&D Institutions depends on the continuous supply of well trained scientists.

## DEVELOP LOCAL CAPACITY IN THE AREA OF SCIENTIFIC RESEARCH

In a fast changing world, the South continues to face overwhelming challenges. This calls for concerted efforts to develop local capacity in the field of scientific research, which is the foundation of scientific and technological advancement. The meeting proposed some solutions to achieve this target with specific reference to Uganda, which is the twentieth poorest nation in the world. These are given as follows:

- Instate active contribution of donor agencies, private sector and government bodies towards research and development through a formal mechanism;
- Allocation of adequate budget and personnel for Uganda National Council for Science & Technology (UNCST) to pursue research programs;
- Make use of and channel the research output for mass usage, i.e., by providing sufficient funds for publications to be brought out, convening of exhibitions, seminars and workshops;
- Enhance and promote the incentive systems in the field of research and improve the remuneration criteria.

## ESTABLISHMENT OF S&T INSTITUTIONS FOR HARNESSING SUSTAINABLE DEVELOPMENT

The speakers of the meeting enlightened the gathering about the effectiveness and relevance of scientific and technical systems in the context of indigenous needs. Recommendations given in this regard are as follows:

- Establishment of regional sustainable development centers/networks in representative locations primarily in poverty-stricken areas of the world;
- Mobilization of expatriate Third-World scientists, living and working in the North, to examine critical problems in developing countries;
- Achieving the critical mass in human resources complimented by adequate infrastructure, modern

technology and independent research funding mechanisms;
- Focusing steadfastly on research support services and ongoing training programs within the institution;
- Cultivating contacts with other institutions by building networks and centers of excellence.

**COMPREHEND THE ROLE OF UNIVERSITIES IN S&T CAPACITY BUILDING**

Education is critical for improving a country's capacity in science and technology and to address issues related to sustainable development. Following suggestions were given during this meeting:

- The universities should commit themselves to an on-going process of educating, training and mobilizing all the stakeholders of society linked to sustainable development;
- Universities should strengthen new and high-tech research for the realization of sustainable development within the country;
- They should encourage interdisciplinary and collaborative education and research activities;
- They must revamp the present system of education by modifying the courses and programs providing initial or basic education;
- Planned and well prepared availability of human resource to replace retiring people is an important aspect of sustainability.

**ENCOURAGE CAPACITY BUILDING IN BIO-MEDICAL RESEARCH IN PAKISTAN**

The recent developments in biomedical technologies have the potential to alter the scenario of disease management and control. The role of our basic scientists and clinicians thus becomes paramount for evolving a health care and management plan. In this regard, light was shed on the following areas:

- Basic scientists in the fields of Biology, Biochemistry, Biotechnology, Biophysics and Bio informatics need to join hands with clinicians to carry out research for the betterment of human health;
- Orientation of the public and policy makers in the right direction for resolving the local as well as global health problems must be ensured;
- Setting up of a decent Health Research and Delivery System should be given due priority;
- Research in genomics for better diagnosis and development of new vacancies and drugs must be initiated;
- Setting up an infrastructure for genomic research supported by a well-established bio-informatic laboratory;
- Strengthening the existing or budding institutes engaged in genomic research for achieving self-sufficiency in biomedical sciences;
- Train scientists/researchers so that they can acquire the necessary expertise in various aspects of biomedical research.

**RECONSIDERING PAKISTAN'S ENERGY OPTIONS VIZ A VIZ AVAILABLE GEOLOGICAL RESOURCES**

The meeting recommended re-establishing the vital correlation between sustainable development; energy demand & supply; and optimal use of the geological resources. Emphasis was laid at strategizing the guiding principles for determining the right energy mix considering Pakistan's geological richness. The suggestions for policy makers are:

- Concerted efforts should be made to develop a national pool of truly competent professionals to oversee and undertake all aspects of exploration and development of energy resources;
- While R&D efforts may continue and be further accelerated on renewable energy resources, particularly solar, wind and tidal, the main thrust and focus of attention for the immediate future should continue to be on oil, gas and coal. In this connection, the Indus off-shore region in Sindh and the sedimentary troughs between Ras Koh and the Makran hills; and in Kakar-Khorasan area in Balochistan should be given high priority for exploration;
- The use of CNG should be further encouraged and at least 50 percent of the road transport be switched on to CNG by 2007;
- A re-assessment of hydel exploitation-potential should be made on proper scientific lines, particularly in view of the phenomena of global warming and the consequent shrinking of glaciers in the Himalaya-Karakoram region, which according to some computer modeling and climatological predictions are likely to melt in the

next 40 to 50 years. The Indus river system depends heavily on glacial melt for its water flows. All this needs to be urgently and very carefully researched;

- In view of the huge coal exploitation-potential established at Thar in Sindh, and additional resources of coal identified elsewhere in the country, a comprehensive National Energy Policy should be formulated, in which coal should occupy a pivotal position for power generation as well as for in-situ gasification (UCG: underground coal gasification), briquetting and washing. All the production-plants of cement & sugar and other small to medium industries should be made coal-based, instead of using imported fuel;
- The setting up of small coal-based power-plants (5 to 25MW) in the country should be encouraged to provide locally available job-opportunities and a dependable source of power. This will also help strengthen the engineering industry in the country;
- Use of LPG and coal-briquettes should be introduced / encouraged in the mountainous regions of the country, with a view to save the precious wealth of forests;
- Energy conservation projects and awareness programmes with specific reference to environmental protection must be initiated at a national level with the help of both the public and the private sectors.

**EXPLOITATION OF BIOGAS TECHNOLOGY AS A VIABLE ENERGY SOURCE FOR PAKISTAN**

Identifying Biogas as a feasible option for energy, the meeting suggested to:

- Establish a Biogas Research Center for R&D and diffusion of Biogas Technology in Pakistan.
- Design new plant models that are low cost;
- Study anaerobic photosynthetic technology, efficient microbes (E.M) technology & its application for enhancing the efficiency of biogas plants;
- Design and develop commercial / industrial biogas plants based on sanitary waste water, distillery waste, sugar industrial wastes & other agro-industrial wastes; and optimize operating conditions on laboratory/ pilot scale for developing design criteria for a full scale commercial plant;
- Develop methodology for pre-casting the digester and dome structure of biogas plants to enhance speed of construction & ensure gas leak proofing;
- Fabricate biogas digester by cast-in-situ method;
- Manufacture Ferro cement gasholder to replace metallic (M.S) gasholder, which is corroded, particularly in the coastal & saline areas;
- Accelerate gas production rate, through studies on the methanogenic bacteria, their isolation, cultivation, physiology, biochemistry, ecology etc., additive selection, digester types and fermentation technology implementation;
- Systematic training of professional masons, extension managers & technicians;
- Capacity building to enhance capability at grass root level for propagating B.T on mass scale;
- Develop technical, educational and promotional materials for construction and post-installation, operation, maintenance and troubleshooting of biogas plants.

**ACCENTUATE IMPORT SUBSTITUTION OF VITAL MINERALS AND DEVELOPMENT OF MINERAL RESOURCES**

Import substitution of minerals and chemicals of vital importance to industrial development by strategically cutting down negative impact on the national exchequer of Pakistan is the need of the hour. The priority areas highlighted for mineral development and import substitution are:

- Establishment of model mine concept, regarding coal washry, coal beneficiation, and coal banks in each province;
- Utilization of mine wastes, e.g. shale, marble chromites, coal;
- Acquisition of technology for value addition and R&D work on Building stones for local demand and export;
- Development of indigenous technology for utilization of iron ores;
- Establishment of Geo-data centers. Geochemical studies for mineral Identification, resource and geological evaluation of base metals;
- Up gradation / Strengthening of existing laboratories and human resource development in the mineral sector;
- Establishment of Gemstone training institutes.

Some practical suggestions for leveraging the powers of information technology for development and resultant socio-economic uplift in Pakistan were also put forth during the meeting. Following is the crux of pertinent deliberations:

## OPTIMAL UTILIZATION OF ICTs FOR DEVELOPMENT

Pakistan has the most extensive coverage of Internet in South Asia, but has failed to initiate an effective process which could make significant impacts on the lives of the majority of citizens especially in rural areas. Pakistan in terms of grass-root level projects of ICTs has yet to present a good example. The suggestions to improve this state of affairs are:

- Develop a holistic approach that entails looking at the larger picture with deeper understanding of the use of ICTs by different sections of the society. Taking into account socio-cultural factors, like literacy and gender to encourage inclusive and partnership oriented initiatives is also a requirement;
- Exploration of the barriers hindering the best of ICTs for development which include: poor literacy rate, poverty, low tele-density, and unreliable electric supply as main factors;
- Creating mass awareness of the thrust of information communication technologies;
- Overcoming the language and cultural barriers, to make ICTs of any use to the largely illiterate population;
- Government, civil society – especially in the form of social entrepreneurship – along with business and local philanthropy should come together to form partnerships, to explore ICT4D (ICTs for development) initiatives that could be appropriately scaled up;
- Basic Urdu software tools need to be developed in the public domain. This would involve a great deal of coordination and communication, to reach all potential users of Urdu-software so that it would be conducive to use on a mass scale;
- An ICTs for Development 'Academy' should be established to help in bringing together development practitioners and ICT experts and to make need based innovative applications of the technologies for common man;
- Implant a mechanism for correlating and developing long term ties among the domestic software companies and business sector. Strong cohesion among the business and IT industry members, and synergies will enable development of tailor made solutions as per local need and subsequently it will lead the local IT industry to become world class.

## OVERCOME THE CONSTRAINTS TO INSTATE E-COMMERCE IN PAKISTAN

E-readiness of Pakistan is reasonable in terms of infra-structure, promising in terms of e-payment infrastructure and regulatory environment but very weak in terms of e-commerce applications and general user demands. These can be overcome through:

- Creation of intellectual capacity within Pakistan to mobilize the e-commerce drive, IT specialists and key government & business people have already invested a lot of efforts in this area;
- Identify how e-commerce can make a difference in the lives of the people, especially poor, and empower the rural women;
- Demand side of e-commerce applications needs to be carefully analyzed in the local business culture;
- Capacity constraints on e-commerce development require a thorough e-commerce strategy and policy.

## BUILD CAPACITIES IN THE FIELD OF AGRICULTURE FOR SUSTAINABLE DEVELOPMENT

Agriculture continues to be the mainstay of the economies of the developing countries. It is vital to build capacities in this field to meet the challenges of sustainable development. The strategy for capacity-building in agricultural sciences should at least consist of the following

- Strengthening infrastructure, faculty and operational funding in universities imparting education in agriculture and animal sciences;
- Changing the governmental procedures of sending scientists on training (devolving the authority to institutional heads) and, in fact, encouraging young scientists to hunt for training opportunities;

**Recommendations of the Meeting**

- Instituting a system of sabbatical in all research and development institutions;
- All development projects must be bound to have at least 25 per cent of funds allocated for capacity-building;
- Developing a mega-project for strengthening of research and development in agriculture, with a major component of capacity-building.

**RATIONALIZE THE OF NATIONAL AGRICULTURAL RESEARCH SYSTEMS (NARS) FOR SUSTAINED ECONOMIC PROGRESS**

The meeting appreciated the role of NARS in strengthening the agriculture sector of Pakistan. To grow and maintain national economic strength and international competitiveness, one has to transform NARS into a knowledge-based enterprise. The R & D organizations and agencies involved in Agricultural Research should tightly focus on essential programs. Every department should have a clearly defined mission, considering national priorities .It is also proposed that "Compendiums of S & T Management Practices" must be prepared for each R & D organization, in order to restructure, revamp and reform the NARS.

The recommendations for improving NARS in Pakistan with the lead role of Pakistan Agriculture Research Council are highlighted as follows:

- Introduction of knowledge-based Agricultural Research System, giving first priority to the development of human resource. Hundred percent increase in PhD scientists, provision of career-growth opportunities and creation of elite force of strong research managers is needed;
- Role of PARC as an apex body should be clearly defined and strengthened;
- Proposal for "Agenda for Action", which required senior Federal and Provincial policy-makers and research mangers to rebuild the agricultural technology-generation systems in line with the WTO requirements, must be addressed seriously.

**BUILD CAPACITIES IN HEALTH AND SAFETY PARAMETERS OF GENETICALLY MODIFIED (GM) FOODS FOR PAKISTAN**

- Food scientists and technologists should ensure the responsible introduction of GM techniques, provided that issues of product-safety, environmental, social concerns, information and ethics are satisfactorily & adequately addressed.
- There is an intensive need to concentrate on capacity-building in the field of Genetically Modified Foods, at national level, on the part of the government.
- Provision and trade of safe and healthy food is a provincial subject, under the Pakistan constitution, but the matter of GM Foods is a new high-tech field, requiring substantial investment, so it would need to be dealt at the federal level for the establishment of a uniform policy and practice, with large monetary inputs.
- For Pakistan, there is a strong & urgent need to build capacities in S&T infrastructures, specifically related to the Genetically Modified Foods and crops.
- Urgent political and technical attention needs to be given to fill the existing gaps in the adoption and implementation of the National Biotechnology Policy. The issue of GM Foods should be adequately included and addressed in the overall policy-framework of the Biosafety Guidelines.
- Institutions involved in the education of biotechnology should add a course on Agriculture Biotechnology, which includes description and implications of GM Foods.
- The process of making standards, rules and regulations for the import and trading of GM Foods/ products, ingredients, and seeds must be initiated at the earliest.