

## **SUMMARY AND RECOMMENDATIONS**

### **The COMSATS 1<sup>st</sup> Meeting on Water-Resources In the South: Present Scenario & Future Prospects**

Water is likely to be one of the most critical resource issues of the developing countries. A balanced, continuous and sustainable approach is mandatory if the adverse impacts of increasing water-crises are to be avoided. There has been a long history of water-resources development and management in many countries of the South with conditions similar to Pakistan, in terms of supplies, demands, development/management strategies and socio-economic as well as socio-environmental conditions. Many international agencies are providing support in enhancement of water resources development in the South. Looking at the global water-resources, it appears that there is enough water; however, a careful study of the global water scenario reveals that 97% of this water is saline. Most of the fresh water on earth is in the form of glaciers and ice or very deep groundwater. Although, water in rivers and lakes is in substantial quantity, yet, due to rapid growth in population and slow pace of new water-resources development, the per capita water supply has decreased significantly in many of the COMSATS Member States in the South. Further, much of the fresh-water reserves in the South are being contaminated through unplanned disposal of untreated wastes into water-courses and on to ground, which is ultimately polluting the potable water reserves.

Water management and conservation are thus fast emerging as critical issues and need to be tackled through a collective and sustained effort by the affected countries. The recent drought spanning a few years period has led many governments in the South to address water-related problems rather more seriously and to formulate and reconsider the national water-policies. Pakistan is no exception. The surface water and groundwater reserves in Pakistan have been significantly depleted by the prevailing conditions of drought. This has seriously unbalanced the water supply and demand relationship in the country.

Over the past 50 years, Pakistan has seen a golden era of water-resources development. This includes successes like the Indus Basin Works, multipurpose storage dams, projects for control of water-logging and salinity, link canals, hydropower projects etc. The scientific

community in Pakistan have gathered vast experience related to all facets of water-resources harnessing and development. Nevertheless, the 21<sup>st</sup> century has brought its own challenges in the water sector. This necessitates that all past programmes related to water-resources development must be critically examined so as to bring the shortfalls to the surface, in order to reshape the strategies and options for optimum development and utilization of our precious resources of water.

Pakistan has finite resource of water which is thus exhaustible. Development of additional potential will improve water-availability, but only in the short run, if additional storage facilities are developed or adequate conservation measures are taken. Major future challenge is to attain food self-sufficiency on an environmentally sustainable basis. However, without requisite water-supply, food and fiber deficits would be irrecoverable.

### **PURPOSE OF THE MEETING & ARRANGEMENTS**

Realizing these facts, the Commission on Science and Technology for Sustainable Development in the South (COMSATS) organized a two-day (November 1-2) meeting on "Water-Resources in the South: Present Scenario and Future Prospects" at its Headquarters in Islamabad. The main objectives of the meeting were three fold: firstly to evaluate the past developments of water resources in the country, in terms of success stories, achievements, failures and overlooks, secondly, to prepare the water-resources professionals to meet the challenges of the 21<sup>st</sup> century, and thirdly, to provide a platform and unique opportunity to water-resources engineers and scientists for closer working collaboration between their respective departments for water-resources research, water-resources development, planning and management, in the interest of the country and the region.

The first announcement and call for papers were prepared and circulated to the concerned national organizations, individuals and environmental NGOs in September, 2001. In

addition, certain individuals were identified as experts in their fields and were requested to present lectures of national importance, related to water-crises & water-resources development, climate change, drought preparedness, isotope hydrology, agriculture and wastewater-related technology options in the South. The response was very encouraging and quite thrilling. Abstracts received were reviewed and the authors were then informed to compile papers according to a specific format. It was decided to publish the papers in the form of a compact proceedings. There was no registration fee for participation in the meeting. A token payment equivalent to US 100/- dollars was made to each speaker, upon submission of the manuscript, in order to encourage them for their participation and consideration.

The meeting was attended on both days by eminent scientists, dignitaries, members of the diplomatic community and government officials. The meeting highlighted the critical issues, in relation to the condition of water-resources in the COMSATS countries.

## INAUGURATION

Dr. Ishfaq Ahmad, Special Advisor to the Chief Executive of Pakistan, inaugurated the meeting. In his inaugural address, Dr. Ishfaq Ahmad explained that global climatic changes, expanding population, rapid industrialization, pollution, are all contributing to the current stress on water resources. It is important that modern scientific tools be used, particularly the nuclear or isotope techniques in hydrology, in national projects and programmes for development of water-resources, water conservation, water pollution and water-management efforts.

The meeting was specially attended by the High Commissioner of Sri Lanka, General Weerasooriya, and the Ambassador of China Mr. Lu Shu Lin. In their keynote addresses, both dignitaries underlined the need for further strengthening the collaboration among the countries of the South and creation of mass awareness about the critical water-issues. They were appreciative of the initiative that COMSATS has taken and pledged full support for further COMSATS' mission in bringing about sustainable socio-economic development in the South.

Dr. Hameed Ahmed Khan, Executive Director COMSATS, while outlining the objectives of the meeting elaborated that COMSATS

realized the criticality of water-issues in the South and, therefore, decided to hold a meeting on these, so that countries of the South can collaborate and come up with strategies to mitigate the effects of the problem.

The inauguration was followed by five technical sessions spanning two days. Well known water-experts, isotope hydrologists, climatologists, water-resources engineers, irrigation experts, water planners and environmentalists, dwelt upon the management and better utilization of water-resources to meet future challenges in the South.

## PARTICIPATION

A total of 94 participants took part in the deliberations of the meeting, including 52 executives from 10 different organizations belonging to various government/semi-government departments, research establishments, universities and environmental NGOs dealing with water resources development, water management, and planning. The key organizations included the following:

- *Federal and Provincial Secretariats (GoP)*
- *Pakistan Council of Research in Water Resources (PCRWR)*
- *Irrigation and Water Department (GoP)*
- *Irrigation & Power Department (GoP)*
- *Indus River System Authority (IRSA)*
- *Federal Flood Commission (GoP)*
- *Department of Meteorology (GoP)*
- *National Agricultural Research Council (NARC)*
- *Agriculture Prices Commission (APC)*
- *National Physical Standards Laboratory (NPSL)*
- *Pakistan Atomic Energy Commission (PAEC)*
- *Pakistan Institute of Development Economics (PIDE)*
- *Sustainable Development Policy Institute (SDPI)*
- *Universities and Academic Institutes*
- *Non-Governmental Organizations (NGOs)*

## TECHNICAL SESSIONS

In four (4) technical sessions of this meeting, 22 lectures were delivered on the current situation of water-availability, demand, supply, development and management in arid and semi-arid regions in the South, and with

## Summary and Recommendations

special reference to Pakistan. The scientific and technical level of all presentations was very high. These presentations covered the following key areas of concern:

- *Water-Resources Development and Management*
- *Drought Preparedness and Mitigation Management*
- *Climate-Change and Flood Control*
- *Isotope Hydrology*
- *Groundwater Pollution*
- *Marine Pollution*
- *Agriculture*
- *Water-related Technology Options and Development*

The delegates to the conference stressed the need to devise and implement the "National Water Policy". The delegates also called attention to the importance of research on water-resources and water-related issues in Pakistan. In view of the contents of various presentations and thought-provoking discussions during the meeting, the expert delegates to the meeting carefully addressed and discussed the sector-wise water-related issues / challenges faced by Pakistan. The interaction of participants was mutually beneficial and the discussions over tea-breaks were very thought provoking. The exchange of ideas generated a lot of interest among participants to know more about the water-scenarios in the South. The participants came up with proposals and solutions as to how water-resources can be best managed and utilized most efficiently. Based on these discussions and suggestions received by participants at individual level, the panel of COMSATS experts formulated a series of recommendations for future directions. These recommendations have been presented in the end of this chapter of this proceedings, for consideration by the Federal and Provincial Governments, water-related bodies, environmental NGOs and the EPAs, as well as the common citizens of Pakistan. The basic objectives of COMSATS 1<sup>st</sup> meeting on water-resources were thus adequately met.

## CONCLUDING SESSION

The concluding session of the meeting was chaired by the Federal Secretary, Water and Power, Mirza Hamid Hasan. Dr. Hameed Ahmad Khan, while summing up the two-day proceedings put forward some recommendations for the consideration of the member countries and their governments. He said the governments of the region need to make policies for conservation of water-

resources and should also put in place a system that forecasts droughts, assesses damages and provides relief to the affectees. He also emphasized that better understanding of global climatic changes and development of techniques to predict its effects is the need of the hour. He opined that appropriate technologies be introduced for treatment of industrial and domestic waste and for the purification of sea-water for drinking purposes. Dr. Khan, while concluding his speech, expressed gratitude to the participants for making this COMSATS initiative a success.

In his closing address, the chief guest, Mirza Hamid Hasan, Federal Secretary, Water and Power, lauded COMSATS for taking up a very important issue as the theme of the meeting and said that the government of Pakistan would extend every possible help to support this COMSATS initiative towards conserving water-resources. He emphasized that water-related issues should be tackled through collaboration of the international community, since these issues have assumed regional and global proportions. The closing session of the meeting was also addressed by the Charge d' Affaires of Syrian Arab Republic, Mr. Badi Khattab and the Deputy High Commissioner of Nigeria, Mr. T.Y. Opatola. Both dignitaries were appreciative of COMSATS; efforts to highlight problems in relation to water and called for more sustained initiatives to find solutions for these problems. The meeting ended with a vote of thanks to COMSATS for providing such a wonderful forum.

## RECOMMENDATIONS

The delegates to the conference called attention to the importance of research on water-resources and water-related issues in Pakistan. In view of the contents of various presentations and thought-provoking discussions during the meeting, the expert delegates to the meeting carefully addressed and discussed the sector-wise water-related issues and challenges faced by Pakistan. Based on these discussions, and suggestions received by participants at individual level, the panel of COMSATS experts formulated the following recommendations for future directions:

### DEVELOPMENT AND MANAGEMENT OF WATER-RESOURCES

- Pakistan's "National Water Development and Management Policy" should be issued at the earliest possible moment.

- Short term, intermediate term and long-term measures must be carefully sorted out and adopted to manage sustainable water-supplies for drinking purposes, as well as for agricultural purposes, to boost the agrarian economy of South Asian countries, specially Pakistan.
- Long-term strategies are costly, but can be optimized from economic viewpoint. The long-term strategies, including formulation of a regulatory framework on groundwater-abstraction, construction of large storage dams, better forecasting mechanisms for flood and drought, and resolving water-distribution problems between regions and provinces, should be given top priority to solve the water-availability and water-quality problems. Efforts should be made not to politicize projects of such national importance.
- **COMSATS** must stress the constitution of a High-Level Multi-disciplinary Group of top professionals, in the country, to help in and resolve many complimentary, concurrent activities in the watersector development and management.
- Planning, development and management of water-resources is an exclusive subject with the Federal Ministry of Water and Power, the Chief Engineering Adviser, the Pakistan Council for Research in Water Resources (PCRWR), the Center of Excellence in Water Resources at Lahore, and the Pakistan Atomic Energy Commission, Islamabad (at PINSTECH). The Federal Ministry of Agriculture and the Federal Ministry of Planning & Development are also closely associated with the issues of Water-Resources Development & Management. These organizations can contribute in determining the direction of the program, the priorities, the grouping of the subjects, and laying down broad guidelines for the water-resources development and management.
- Management/development efforts have to be seen (i) in the light of the benefits to 'haves' Vs "have nots", and (ii) for giving a balance in the regional development, especially for the backward areas.
- The financial/economic aspects, like public/private expenditure, pumped groundwater vs. flow river supplies, small dams vs. large dams, burden on the farmers, traditional water-rights and the paying capacity of the users, need in-depth considerations for their complimentary planning.
- Existing statistics on subsurface water and glacial melts in South Asian countries are inadequate or faulty and, so, there is an urgent need to improve these statistics for future planning of water resources in the South.
- Shortage of water is not a major problem at the moment, but the mismanagement of water-resources is a problem of key concern.
- The storage quantum to year 2000 needs correction.
- Participatory management of water-resources, compatible with local socio-political environment must be supported.
- There is a need for sustainable and efficient management of water-projects, with emphasis on effective monitoring and evaluation systems & strategies.
- Government must pay due attention to increasing the developmental activities in the water-sector and to improve upon the deteriorating health of irrigation infrastructure.
- Farmers should be educated to better handle water-losses.
- The water-distribution systems must be geared to match water-requirements of the community and the farmers.
- Rising trends in some canal commands need to be checked.
- "Abiana" (water rates) for irrigation purposes must not be increased at all, as this will result in adverse effects on agricultural outputs since most of the farmers can not pay because they are living below the poverty line.
- Technical services and spare parts be made available to farmers, in order to sustain the use and maintenance of new technologies.
- Agricultural research is required in order to improve water-stress resistant crop-varieties.
- Cultural practices of "Pancho" irrigation-system must be replaced by more efficient irrigation practices.
- There is a need for construction of additional storage. Pakistan has not been able to construct and add even a single reservoir into the national pool of water-reserves after Mangal Dam and Tarbela Dam. Adequately large and small storage reservoirs should be built, in order to meet the future water-needs. Silt-control to enhance reservoir-life and water-holding capacity, should be made the essential part of dam construction. Nuclear techniques should be used to study the

## Summary and Recommendations

mechanisms of sediment transport and deposition in large reservoirs.

- The Community, in general, and farmer associations, in particular, must be involved in watershed management programmes and water-resources development and management schemes, such as small storage dams, rain-water harvesting, especially in desert areas like Thar and Cholistan desert; and water conservation programs, such as optimization of the canal-water regulatory and distribution system for irrigation water supply.
- The mechanized, and capital, as well as energy intensive, water-saving options like drip-irrigation, trickle-irrigation need consideration for their merits and limitations, and specific applications.

### **DROUGHT PREPAREDNESS AND MITIGATION MANAGEMENT**

- The countries in South Asia must put in place a system that forecasts droughts, assesses damages and provides relief & assistance to minimize the hardships of life.
- Short-term, intermediate term and long term measures must be adopted to mitigate the effects of drought and to manage sustainable water-supplies for drinking and agricultural purposes, in order to improve the socioeconomic status of inhabitants in arid regions in South Asia, such as the Thar desert in Pakistan.
- Among the drought-affected areas in Pakistan, the Thar desert is the most important and biggest zone vulnerable to drought. The groundwater-exploration done by different organizations in the Thar desert during the past 50 years, using geophysical and hydrological tools as well as satellite tools, should be integrated to develop a database on groundwater resources of this arid zone.
- Special research funding and grants must be provided to encourage and undertake detailed hydrological investigations in the drought-vulnerable zones, under M.Phil & Ph.D projects by university graduates.
- Future groundwater development in the arid zones should be monitored, considering the subsurface hydrogeological models. Moreover, rainwater-harvesting should be encouraged, based on research studies closely supervised by experts in universities and government institutions

dealing with water-resources research, development and planning.

- For drought-stricken areas, the following mitigation and management measures have been recommended as inevitable for drought control and mitigation:
  - a. A dependable drought-forecasting programme must be initiated.
  - b. The areas vulnerable to drought must be precisely identified and the causes of drought be kept in view, before chalking out any strategy for drought-mitigation.
  - c. The environmental, social and economic implications of the drought events in an area be compiled, in terms of an impact assessment.
  - d. The early-warning system (of the order of a season or so) be improved and strengthened. In Pakistan, the responsibility for this task should be given to Pakistan Meteorological Department (PMD).
  - e. Use of modern and appropriate techniques, such as nuclear/ isotope techniques, should be encouraged to evaluate the history of drought in the area.
  - f. Adequate strategies for drought-mitigation, in terms of description of practical step-by-step processes, should be developed for identification of mitigation actions that can reduce potential drought-related impacts before the occurrence of drought event
  - g. The planned operations in drought-affected zones must be closely and continuously monitored.
  - h. Water-management should be optimized at macro and micro levels.
  - i. Efficient extension-services should be facilitated to farmers, in terms of selection of suitable crops, improved availability of fertilizers, better seeds, timely dissemination of information regarding canal operations, etc.
  - j. Post-disaster needs must be strictly kept in view and implemented.

### **CLIMATE-CHANGE AND FLOOD CONTROL**

- There is a vital need for adequate understanding of the recent and past climatic history of snow and glacial melt in Northern Pakistan, for estimation of present and future risks of flooding at sites traversed by the Indus River. Isotope hydrological and isotope palaeoclimatic techniques should be applied for this purpose, in conjunction with classical techniques in climate science.

- There is a need to build as many reservoirs as possible along the major water courses and rivers in Pakistan, to tap flood-flows and conserve water for national needs.
- The inadequate investments in the drainage-system must be checked and rectified for future strategies.

#### **WATER QUALITY**

- The continuity of the National Water-Quality Monitoring Programme initiated by the Pakistan Council of Research in Water Resources (PCRWR) should be ensured.
- The National Environmental Quality Standards for discharge of industrial effluents and stack-emissions should be effectively enforced.
- The National Environmental Quality Standards for drinking-water should be formulated.
- There should be water-quality monitoring check-points at the confluence of polluted streams with major water-courses (rivers) and marine natural outfall zones along the coast of Pakistan.

#### **TECHNOLOGY OPTIONS AND DEVELOPMENT**

- There is a strong need for introduction and development of appropriate new technologies for water-resources research, water-use efficiency and water conservation.
- Economic treatment of industrial & domestic wastewater by conventional technology and, in some cases by commercial-scale radiation-technology, should be carried out to a level that it can be safely used for agricultural purposes as well as for domestic and municipal purposes, such as for gardening, washing of roads, cars etc. The use of nuclear desalination plants for purification of seawater for domestic use (drinking and washing purposes) and for generation of electricity may also be considered.
- Biotechnological development must be made for saline agriculture, in order to enable normal cropping operations in saline / sodic soils and in large tracts of the Indus basin and the coastal belt, where saline groundwater is available for irrigation purposes. Presently, the cost of agriculture-related bio-active products is reduced by 40 % but it is still high for routine adoption by the farmers.

COMSATS must help in commercializing this new approach.

- Modern techniques, such as isotope techniques/nuclear techniques, must be used in conjunction with space technology (remote-sensing technology) and Geographic Information System (GIS) to explore and estimate water-reserves, as well as groundwater recharge mechanisms and interconnection of shallow and deep groundwater reserves etc.
- The Community must think of reviving long –forgotten old technologies for water-conservation and natural purification, such as use of pitchers.
- The laser-leveling equipment is very useful to ensure precision land-leveling. The apparatus has been indigenously fabricated by PAEC at PINSTECH, Islamabad (Pakistan), at costs 40% less than the similar imported devices. Local and regional farmers must opt for this technology to conserve water in the irrigation fields. The Government and the NGOs must take practical steps to commercialize the manufacturing, marketing, supply and access of this technology to the farmers for better results.
- The wastage of water from domestic and household activities is quite significant in the region, specially in Pakistan. Appropriate technology options may be used to conserve water. This may include technological options, for example, use of time-controlled water taps (water taps with spring-lever system), improved design of W.Cs to conserve water; and imparting education to the community for awareness of the increasing shortage of our national water-reserves and the need to conserve water for the present generation as well as for future needs.

#### **ROLE OF COMSATS IN MANAGEMENT AND DEVELOPMENT of NATIONAL WATER-RESOURCES**

The delegates of the 1<sup>st</sup> Meeting on Water-Resources appreciated the pioneering efforts of COMSATS in holding the meeting with great success in a field that is new to them. The delegates emphasized that COMSATS should take the lead in seeking dissemination of the meeting's recommendations and in setting the trend for implementation of suggested solutions to mitigate water-sector problems. The participants urged COMSATS to play an active

## Summary and Recommendations

role in targeting the following needs for water-resources development & management and water-conservation in Pakistan and in COMSATS member states:

### *Need for Regular Meetings and Training Workshops on Water Resources*

In view of capital-intensive aspects of Water-Resource Development and the tight financial resources of the developing countries, it is imperative that great emphasis be laid on water-conservancy. The first and foremost step in this direction would be to create an awareness in the people about this issue, whereby every single man has to know how he can reduce wastage and improve conservation. This can be done through a mass orientation and training programme through all types of media, as well as practical demonstration training. By conservation in every sector of water-usage i.e. domestic, urban, industrial, agricultural and environmental improvement, Pakistan can achieve present self-sufficiency to a great extent. COMSATS must continuously hold water-related meetings, seminars, conferences and national/regional-level training workshops for the purpose of education and planning. COMSATS should also arrange similar training and orientation programmes in other member States, by mutual arrangement.

### *Setting up a COMSATS Experts Advisory Cell at National Level*

Experience and past observations reflect that, in Pakistan (as also in other countries in the South), reliance is generally placed on advice of foreign experts in handling medium and large-scale projects. These experts generally lack local knowledge of ground-conditions, environment, demands and available

capabilities and, thus, give their “unbaked” opinions, which are accepted by most funding agencies. Moreover their advice is generally subjective, i.e., their own interest. Sometimes, even the local consultants, either because of not having the related expertise, or just under local political pressures fail to be objective. It is, therefore, important to recommend that an experts-cell should be created at COMSATS, by picking experienced and qualified experts from the national water-sector.

### *Setting Up a COMSATS Regional Level Experts Advisory Cell*

From regional view-point, it imperative that COMSATS countries set up a central pool of experts, picked from each member state, and having authority and experience in different disciplines of water-resource development and management. Their sole responsibility would be to scrutinize and check various Projects proposed in the COMSAT countries and give their expert and unbiased opinion about the viability and economics/need of each project, without being handicapped or tied to any local political or regional compulsions or the Donor-country pressure to achieve the following objectives:

- I. Optimization of technical/ financial parameters for schemes in various sectors of water-resources management, to suit each country's demands and financial resource. This would also be helpful exercise for different regions within the same country.
- II. Giving a implementation priority of all medium and major schemes in various countries compatible with their overall objectives.
- III. Maximum utilization of local expertise or expertise from other COMSAT countries and local men and material deployment.