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Group Photo of the Participants of International Workshop on Nanotechnology for Young Scientists (IWYS-2016), Malaysia (page 06)

Inside this Issue

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From the Executive Director's Desk

As the readers go through the pages of this issue of the newsletter, 2016 would have already drawn to its end. A lot that happened during the year would start to become a memory of days gone by, while a lot is going to be passed on to 2017. Every New Year holds a promise for new beginnings and resolutions for a better future. For many, however, 1st January is another changing date of the Gregorian calendar, as the tall claims in improvement of socio-economic indicators and development of a few nations provide little hope for global development on the whole amidst growing concerns for peace and stability.

The new Secretary General of the United Nations, Antonio Guterres, who succeeded Mr. Ban Ki-Moon in October last year, in his New Year message has rightly called for the world to "resolve to put peace first". He urges, "Let us make 2017 a year in which we all – citizens, governments, leaders – strive to overcome our differences". The narrative on world peace has always been relevant and becomes more and more so each year amidst the growing chaos around the globe. Regardless of the amount of truth the conspiracy theories and the media reports hold as to the causes and instigators of the exacerbating security issues around the globe, there is no denying the fact that socio-political upheaval at national and regional levels are a constant threat to development in all its forms. Recent examples of the domino effect of such destruction and upheavals can be seen from the situations in Afghanistan, Iraq, Yemen, Burma and Syria. Massive destructions of infrastructure cripple the economies of the suffering countries, while millions are forced to live uncertain fates as immigrants under the fear for their lives. In the current cyber age, we are no stranger to the plights of these millions, and the resulting growing disparity around the globe, inevitably bewilders the common man with regard to sustainable development.

The purpose of the aforementioned facts is not to undermine the developments and breakthroughs that the erudite minds have made around the globe in a number of fields. The expanding frontiers of knowledge, especially in Science and Technology, are providing new solutions to many socio-economic problems of the present day. However, for the new knowledge to go beyond safeguarding the interests of a few in order to benefit the masses around the globe, agreement on a common global agenda based on peaceful co-existence is critical. This calls for stronger and wider collaborations among nations and regions. COMSATS' role, therefore, is strongly oriented towards the consciousness of the same and is reflected in its mission, which is to "to help create a world where all nations are at peace with one another and capable of providing a good quality of life to their populations in a sustainable way, using modern scientific and technological resources."

I wish all the readers of this issue a peaceful and prosperous New Year and welcome feedback on the contents of this publication.

NEWS/ACTIVITIES/HIGHLIGHTS FROM COMSATS SECRETARIAT

COMSATS' Delegation Meets the Senior Officials of Mohamed V University, Rabat, Morocco

A delegation of COMSATS visited the Mohamed V University, Rabat, Morocco, on 20th December 2016, and held a meeting with its senior officials with a view to discuss matters related to the University's induction in COMSATS' Network of International S&T Centres of Excellence. The meeting was held on the sidelines of the 6th COMSATS-ISESCO-INIT International Workshop on 'Internet Security: Enhancing Information Exchange Safeguards', held in the city, from 19-23 December 2016 (Page 05).

The COMSATS' delegation, comprising of Mr. Tajammul Hussain, Advisor (Programmes), and Mr. Farhan Ansari, Sr. Assistant Director (Programmes), called on Prof. Rajaa Cherkaoui El Moursli, Vice President for Research, Innovation and Partnership, Mohamed V University. Also present during the meeting was Prof. Nadia Motii, Incharge International Relations.

With regard to the prospective induction of Mohamed V University in COMSATS' Network. Prof. Moursli handed over to COMSATS' officials the duly filled-in prescribed pro forma to initiate the induction process that includes technical evaluation for suitability as a Centre of Excellence of COMSATS. Mr. Hussain informed the University officials that as per the standard practice the submission of the pro forma will be followed by a first-hand evaluation of the technical capacity of the university by a two-member delegation of COMSATS' Technical Advisory Committee (TAC), who would visit the University in due course.

In order to further streamline the formalities in this regard, COMSATS' officials hoped that the President of Mohamed V University would soon confirm participation in the forthcoming 20th Meeting of COMSATS Coordinating Council to be held on 15-16 May 2017, in Cairo, Egypt, to present the case of the University's inclusion in COMSATS' Network. The Council would deliberate on the matter based on the University's presentation, and TAC members' evaluation, and decide accordingly. The officials of the Mohamed V University communicated strong assurances as to the participation of the President of the University or his representative in the 20th Council Meeting.

Discussions during Meeting of COMSATS' Delegation with Mohamed V University Officials

With an objective to further familiarize the University officials about COMSATS, the visiting delegates highlighted the structure and ongoing activities of the organization. These included its capacity-building programme, International Thematic Research Groups (ITRG), scholarships and short-term training opportunities available at COMSATS Institute of Information Technology (CIIT), Pakistan, and other affiliated Centres of Excellence. Mr. Hussain invited the University officials to visit CIIT to explore avenues of collaboration in the areas of mutual interest. Information package and a brief on COMSATS' past collaboration with Morocco were handed over to the University officials.

Prof. Moursli expressed interest of the University in taking part in COMSATS' International Thematic Research Groups (ITRGs) on 'Mathematical Modeling' and 'Renewable Energy', which are two of the focus areas of the University. In this regard, she showed interest in hosting the next meeting of COMSATS' ITRG on 'Mathematical Modeling' at Mohamed V University during 2017. She also pledged to explore possibilities of creating provisions for scholarships at Mohamed V University for students from COMSATS' Member States.

The meeting concluded with a mutual pledge to closely cooperate in different areas of science and technology for achieving common objectives.

COMSATS Celebrates World Science Day 2016

COMSATS organized a seminar on 'Science Centres and Science Museums' on November 17, 2016, in Islamabad, Pakistan, in connection with World Science Day for Peace and Development 2016. The event was held in collaboration with the Office of Research, Innovation and Commercialization (Professional Development Department) of COMSATS Institute of Information Technology (CIIT), Pakistan.

The event was inaugurated by Dr. Ishfaq Ahmad, a veteran scientist and former Special Advisor to the Prime Minister of Pakistan on Strategic Programmes. Speaking on the occasion, Dr. Ahmad stressed the need for making concerted efforts for the promotion of Science and Technology in the country. He noted with pleasure Pakistan's role in institutionalizing UNESCO's World Science Day for Peace and Development, for which he personally played an important role in the late nineties.

Dr. Ishfaq Ahmad Addressing the Audience as Chief Guest at the Inaugural Session of WSD 2016

The Guests and Participants of the World Science Day Seminar held in Islamabad

Earlier, Dr. Raheel Qamar, Dean, Research, Innovation and Commercialization, CIIT, delivered welcome remarks. He noted that science centres help nurture scientific thought and encourage the masses towards research and scientific learning.

A message from the interim Executive Director COMSATS, Mr. Fazal Abbas Maken (also the Federal Secretary, Ministry of Science and Technology, Government of Pakistan) was read out by Mr. Tajammul Hussain, Advisor Programmes (COMSATS). Mr. Maken highlighted COMSATS' role over the years for the promotion of science and technology in the developing countries, which is in keeping with the spirit of the World Science Day. He opined that science centres and museums help develop understanding of the physical laws of nature, raise public awareness regarding current research activities and stimulate interest in science among students.

Mr. Raza Shah, National Professional Officer, Natural Sciences, UNESCO Country Office, Islamabad, read out the message of the Director General UNESCO, Dr. Irina Bokova. The Director General considered science centres important for capacity-building, advocacy, and to send strong messages about the importance of science for sustainable development. She also urged partners and governments to support science museums and centres.

Distinguished Speakers of World Science Day Seminar

The technical session of the event comprised talks by Dr. Zain-ul-Abedin, Advisor, Department of Architecture, CIIT Islamabad Campus; Mr. Mian Attique Ahmad, Secretary General, Museums Association of Pakistan (MAP); Ms. Fatima Sami, Graphic Exhibit Designer, National Museum of Science and Technology (NMST), Lahore, Pakistan; and Dr. Tariq Bin Tahir, former Director General, Pakistan Atomic Energy Commission (PAEC).

In his presentation, entitled 'Science in Service of Museums and Heritage: the Role of CIIT', Dr. Abedin noted that a lot of learning occurs outside classrooms and that museums and science centres encourage critical thinking. Representing a higher education institution (HEIs) himself, he noted that the role of museums has evolved over the decades and HEIs need to integrate museums in teaching methods as a high impact, significant, and experience-based knowledge interface.

Mr. Ahmad's talk was entitled "Role of Science Centers and Science Museums as Educational Institutions at Regional Level". He asserted the need for promoting museology in Pakistan, for which deemed crucial the government's support, in addition to the support of general public. He shared his experience of working at district-level for establishment of museums, as well as the aspirations of MAP for undertaking innovative measures in collaboration with CIIT in this regard.

Ms. Sami introduced NMST as a non-profit organization working for the society and its development. She informed that the Museum acquires, conserves, and exhibits the tangible and intangible heritage of humanity and its environment for the purpose of science education, study and enjoyment. She noted that the principal operations of the Museum include collection of specimens and other

materials relevant to S&T, carry out exhibitions and science fairs, and organize focused science education activities. NMST has around a hundred thousand visitors each year.

Dr. Tariq presented a proposal on establishing 'Children Science Discovery Centre' in the country, benchmarking renowned museums from around the world. He noted the changing paradigm in science museums that now encourage more interactivity, apart from exhibiting ideas, artefacts and technologies. He noted that such centres are especially designed for children to encourage greater learning in science and engineering.

Mr. Tariq's proposal stirred the interest of the audience and a participant, Mr. Arif Masoud, who is a Consultant (Architect) to CIIT, offered to collaborate with him.

COMSATS' International Thematic Research Group on 'Renewable Energy' launched in Iran

COMSATS' International Thematic Research Group (ITRG) on 'Renewable Energy' was launched on 2nd November 2016, in Zahedan, Iran. The group was inaugurated during a meeting held in conjunction with the Regional Expert Meeting on 'Renewable Related Energy Focusing on Microalgae Technology Using Ocean Resources including Solar and Fuel Cell' (Page 08). The meeting was jointly organized by Iranian Research Organization for Science & Technology (IROST) and the University of Sistan and Baluchestan, Iran. It was chaired by the designated Group Leader, Prof. Nasrin Moazami of IROST.

The foundation meeting aimed to identify the common areas of research interest and expertise of the participating scientists and initiate a joint research project in the field of renewable energy to be executed by the group. The meeting was attended by about 40 research scientists belonging to Iran, Bangladesh, Kazakhstan, Syria and Spain.

Concluding Ceremony of the Foundation Meeting of COMSATS' ITRG on 'Renewable Energy'

On behalf of COMSATS, Mr. Farhan Ansari, Sr. Assistant Director (Programmes), made a presentation introducing participants with COMSATS and its ITRG programme. The joint research project agreed upon by the group, Mr. Ansari noted, would help collectively address the socio-economic challenges being faced by the developing countries. He thanked IROST and University of Sistan and Baluchestan for jointly hosting the meeting and making excellent arrangements for it.

The Group Leader, Prof. Moazami, welcomed the participants of the meeting for their participation and thanked them for their willingness to collaborate in the field of renewable energy. She considered the COMSATS' ITRG on 'Renewable Energy' a useful forum for facilitating collaboration among the developing countries in the field.

During the working session, the participants shared the areas of their research expertise as well as the ongoing research activities at their parent institutions. Among these were: Dr. Mohamed Dakkak, Associate Professor, Renewable Energy Lab, Higher Institute for Applied Science and Technology (HIAST), Syria; Dr. Gauhar Mussabek, Senior Researcher, Department of Solid-state Physics and Non-linear Physics, Al-Farabi Kazakh National University, Kazakhstan; Ms. Afrina Sharmin, Scientific Officer, Bangladesh Council of Scientific and Industrial Research (BCSIR), Bangladesh; Dr. Ebrahim Asl Soleimani, Professor, Thin Film and Nano Electronic Research Center, Iran; Dr. S. Masoud Barakati, Assistant Professor, University of Sistan and Baluchestan, Iran; and Dr. Akbar Shabani Kia, Technical and Executive Deputy, Renewable Energy Organization of Iran (SUNA), Iran.

On the basis of their expertise and interests, the participating scientists formed three groups focusing on Bio Energy, Solar Energy and Fuel Cell Technology, in order to discuss and decide on the potential topics for the group's joint research project. As an outcome of these discussions, the following two topics were selected to be executed by the group: (i) Measurements and Characterization of New Silicon Crystalline Solar Cells; and (ii) Development of Microbial Fuel Cells for Bioelectric Generation and Wastewater Treatment.

It was decided that the group members will jointly prepare comprehensive project proposals on the afore-mentioned topics, which will be submitted to the donor agencies for securing necessary funding.

The group members agreed to share the research facilities available in their respective institutions, and publish joint research papers based on their collaborative research findings, acknowledging the support provided by COMSATS.

SPECIAL SECTION: COMSATS' INTERNATIONAL CAPACITY-BUILDING EVENTS IN MOROCCO, MALAYSIA AND IRAN

COMSATS has been regularly organizing scientific activities in its Member States in collaboration with its partner national and international organizations. The focus of these S&T capacity-building activities in the developing countries is to respond to the needs of the scientific communities encourage scientific research and sharing of experiences amongst them. Short reports of three such events recently organized in Morocco, Malaysia and Iran are as follows.

6th International Workshop on 'Internet Security: Enhancing Information Exchange Safeguards', Rabat, Morocco (19th-23rd December 2016)

The 6th International Workshop on 'Internet Security: Enhancing Information Exchange Safeguards' was held from 19th to 23rd December 2016, in Rabat, Morocco. The event was jointly organized by COMSATS; the Islamic Educational, Scientific and Cultural Organization (ISESCO); and the Inter Islamic Network on Information Technology (INIT).

The workshop was inaugurated by Dr. Tariq Mahmood, Director (Science and Technology), ISESCO, on 19th December 2016, at ISESCO Headquarters in Rabat. The inaugural ceremony was attended by a number of Information Technology (IT) professionals, researchers and students, belonging to universities, R&D organizations and government departments of Morocco.

In his address, Dr. Tariq Mahmood welcomed and thanked the subject-experts/resource-persons as well as foreign and local participants for their participation in the event. He informed that ISESCO is striving to create a critical mass of IT experts in the Islamic countries, in order to safeguard information available in cyber space. He admired the five resource persons of the workshop for travelling long distances in order to train the participants of the IT workshop. He believed that the imparted skill-sets will help the trainees to effectively perform their duties, and possibly contribute as master trainers in their respective organizations/countries in the future. He also acknowledged the support of COMSATS and INIT for organizing the event in Rabat.

Dr. Mahmood (ISESCO) Delivering his Address during the Opening Ceremony of the Workshop

Earlier, Mr. Fazal Abbas Maken, Executive Director COMSATS, in his message read out on the occasion by Mr. Tajammul Hussain, Advisor (Programmes) COMSATS, stressed the need of capacity-building of cyber security professionals and IT experts in order to ensure that the identities, documents and passwords of individuals, organizations and businesses are not compromised. He acknowledged the consistent support of ISESCO and INIT towards COMSATS' programmes and activities in the common Member States, and looked forward to more fruitful collaborations in future.

Mr. Tahir Naeem, Executive Director INIT, called for greater efforts and collaboration in order to safeguard the online environment against cyber-crimes and misuse of information. He also shared the mission and ongoing activities of his organization in the field of Information Technology.

The technical sessions of the five-day workshop had participation of 40 young researchers, academicians, system administrators and cyber security professionals, belonging to Palestine, Uzbekistan, Iran, Sudan, Gambia, Ivory Coast, and Morocco. The event provided a forum to the participating researchers and professionals to learn about the latest advancements in the field of Internet security; use of state-of-the-art technologies for protection of network and network accessible resources from different types of software attacks; and working out effective Internet/information security solutions for general public, governmental organizations and commercial enterprises through rigorous risk analyses and security management approaches.

During the first technical session, Dr. Haider Abbas, Research Fellow/Assistant Professor, Center of Excellence in Information Assurance, King Saud University, Saudi Arabia, imparted training on 'Organizational Security'. He covered the following topics: certification of organizations; practical approaches to organizational information security management; ISO 27001: information security management system; risk assessment; risk calculation methods and treatment strategies; gap analysis; information security policy/procedures writing; and information assets identifications & valuation. He also conducted practical exercises on undertaking gap analysis; risk assessment & treatment; making statement of applicability; internal/external auditing; and organization's certification process.

Technical Session of the Morocco Workshop in Progress

The second technical session was conducted by Mr. Zafar Iqbal Mir, Deputy Head, Information Security Risk, MENA – HSBC, UAE. He covered topics related to dissecting a cyber-attack, including reconnaissance (Recon), scanning, gaining access, maintaining access, and covering and hiding tracks. He also touched upon topics related to various types of attacks, including anatomy of a sample distributed DoS (DDoS) attacks, evolution of botnet configurations and DDoS attacks, the concept of 'kill chain', mitigation techniques and layered security approach.

The third session was conducted by Mr. Syed Mustafa Raza, Director - Solutions & Consulting (Info Sec), IXTEL Dubai, and Consultant (Pre-sales Solutions), Gulf Bridge International, Qatar Foundation Group, UAE. He imparted training on the following aspects of cyber security: defining vulnerability, exploit, threat and risk; creating a vulnerability report; conducting an initial scan; common vulnerabilities and exposure (CVE) list; vulnerability detection methods; types of scanners; port scanning and OS fingerprinting; enumerating targets to test information leakage; types of exploits: worm, spyware, backdoor, rootkits, and denial of service (DoS); deploying exploit frameworks; implementing scanner operations and configuration; choosing credentials, ports and dangerous tests; creating custom vulnerability tests; customizing Nessus scans; filtering and customizing reports; interpreting complex reports; and contrasting the results of different scanners.

During the fourth session, Mr. Asad Raza, Professional Technical Faculty Member, Information Security Engineering Department, Institute of Applied Technology, UAE, imparted training on: steps in incident handling; information gathering and reconnaissance; vulnerabilities in Microsoft Windows; metasploit framework; exploits and payloads; auxiliary modules; security issues in wireless networks; social engineering toolkit and prevention methods.

The final session of the workshop was conducted by Mr. Muhammad Faheem Qureshi, Lecturer, Abu Dhabi Polytechnic, Institute of Applied Technology, UAE, during which he covered the following aspects of digital forensics: evidence handling; roles and responsibilities; phases of a digital forensic process; memory forensics; storage forensics; and Microsoft Windows forensics. All the technical sessions were highly interactive.

Speaking at the Concluding Ceremony held on 23rd December 2016, Dr. Tariq Mahmood thanked the subject experts/resource persons of the workshop for sharing knowledge and expertise with participants. He called for greater collaboration among the developing countries in this important field. Dr. Mahmood thanked the Organizing Committee members from ISESCO, INIT and COMSATS for working hard to make this event a success. He also thanked the local and foreign participants for their active participation during the workshop. He hoped that the connections made during the workshop will be maintained for future collaborations.

The ceremony concluded with distribution of certificates by the representatives of ISESCO, COMSATS and INIT among the resource persons, local and foreign participants, and Organizing Committee members.

International Workshop on Nanotechnology for Young Scientists (IWYS-2016), Selangor, Malaysia (28th-30th November 2016)

With an objective to provide a platform to young scientists and researchers working in the field of nanomaterials to keep pace with present-day cutting-edge and potentially leading research in the field, 'International Workshop on Nanotechnology for Young Scientists' (IWYS-2016) was held on 28th – 30th November 2016, in Selangor, Malaysia. A diverse group of scientists with a wide range of expertise gathered in Selangor for the event that was organized by

Organizers, Chief Guest and Keynote Speaker of Nanotechnology Workshop

COMSATS in collaboration with the Islamic Educational, Scientific and Cultural Organization (ISESCO) and hosted by the National University of Malaysia (UKM), Malaysia.

IWYS-2016 was inaugurated by Prof. Dr. Imran Ho Abdullah, Deputy Vice Chancellor, UKM, on November 28, 2016. Around 150 subject specialists, researchers and students from 12 countries, namely, Bangladesh, Brunei, China, Egypt, Kazakhstan, Jordan, Korea, Indonesia, Iran, Malaysia, Pakistan, and Turkey participated in the inaugural ceremony.

In his welcome address, the Chairman of the Workshop Central Committee, Dr. Mohammad Hafizuddin Jumali, Associate Professor, UKM, expressed his satisfaction over the presence of a good number of local and foreign resource persons and participants of the workshop. He lauded the support and efforts made by COMSATS and ISESCO for organizing the event. He also highlighted the importance and objectives of the event and hoped that Malaysian participants would benefit from the experiences and knowledge of the international participants.

Mr. Fazal Abbas Maken, Executive Director COMSATS, in his message read out on the occasion by Ms. Huma Balouch, Sr. Assistant Director (Programmes) COMSATS, advocated the need for instituting an effective mechanism for identifying and understanding the broad implications of nano-technology for society that could help policy-makers duly integrate it in strategies for the development of science and technology to tap its full potential. He noted that, realizing the potential of nano science and technology, the developed countries are prudently investing in this field. He also acknowledged the continuous support of ISESCO towards COMSATS' international programmes and activities.

In his inaugural address, Prof. Dr. Abdullah stressed that the technologies being developed by Malaysian scientists and the research activities in the area of nanotechnology need to be commercialized to become one of the effective economic growth engines of the country. He considered IWYS-2016 a golden opportunity for the participants to present their work at an august platform and improve the level of their research. He also thanked resource persons who travelled from the Republic of Korea, Japan, China, Pakistan and Turkey to participate and share their experiences and knowledge.

The workshop stimulated interest of young Ph.D students and early-career researchers in the fields of nano-science, and nano-engineering, as well as provided them a platform to learn the latest developments and help forge early collaborations. The event focused on developing understanding on nanoscale physics, chemistry, engineering, and biology, and facilitate knowledge-sharing among scientists in these fields.

The Workshop had two keynote talks, two invited plenary lectures, six workshop sessions, 20 selected oral contributions, and 50 poster presentations. There was also an exhibition of latest products, services, technologies and innovations made by local enterprises and industry members, including Bruker AXS, RGS Corporation Sdn. Bhd, Gaia Science, Vistec Technology Services, Alpha

A Technical Session of IWYS-2016 in Progress

Instruments Supplies & Services Sdn Bhd, and ITS Interscience Sdn Bhd. The knowledge shared during oral and poster sessions, as well as the exhibition highlighted the practical importance of nanotechnology.

The highlights of the Workshop included a keynote address by a world-renowned physicist, Prof. Dr. Qikun-Xue of Tsinghua University, China, who is the first winner of 'China's Nobel' prize for his pioneering contribution in the Quantum Anomalous Hall (QAH) effect. In his talk, Dr. Xue gave an introduction of three techniques: molecular beam epitaxy (MBE), scanning tunnelling microscopy (STM), and angle resolved photoemission spectroscopy (ARPES), and presented MBE-STM-ARPES study of topological insulators and iron-based superconductors.

The other keynote was delivered by Prof. Ahmet Oral of Middle East Technical University (METU), Turkey, in which he gave an overview of the state of the art Scanning Probe Microscopes (SPM) for magnetic imaging in the 20 mK to 300 K temperature range.

The Workshop sessions covered a number of important topics, such as fundamental description of metallic nano-particles; flexible organic optoelectronic devices using printing process; low dimensional inorganic optoelectronic nano-materials, defects in wide band gap semiconductors for potential use in light sources; acylated chitosan stealth liposomes; as well as one dimensional electronic oxide nano-materials.

Discussions during the event delineated on emerging applications with potentially significant impact on materials, electronics, photonics, and life sciences industries, and encouraged debate on the current strategy and perspectives in nanoscience and nanotechnology.

The event also featured country status reports by international participants from Bangladesh, Brunei, Egypt, Indonesia, Jordan, Kazakhstan, and Malaysia. These, inter alia, covered: applications and benefits of nanotechnology, societal issues, and innovation and commercialization processes.

The topical papers of the event focused on synthesis, characterization and self-triggered assembly of nanomaterials; laser-based materials synthesis; emerging nanoscale materials; doped ferroelectrics; bio-inspired systems and bio-applications; photonic properties; surfaces and interfaces at nanometer scales from electronic to catalysis; nanoparticle-molecule hybrid systems; energy conversion and storage; and optoelectronic and photonic hybrid devices. On last day of the event, a scientific writing workshop was also conducted to help young researchers and students refine their scientific writing and critical reading skills.

The 50 posters covering various aspects and latest developments related to processing, modeling and manufacturing technologies of nano-structured materials were displayed throughout the event around the perimeter of the exhibition area. Relevant universities, R&D institutions and industries participated in the poster contest. The prizes for five best posters were handed out during the Gala Dinner on 29th November 2016.

The event concluded on 29th November 2016 with a vote of thanks by the Chairperson of the Organizing Committee, and distribution of certificates.

The high quality of the scientific presentations, encouraging discussions and the overwhelming positive response from the participants have inspired the organizers to plan another international conference on advanced nano materials in the future.

Regional Expert Meeting on Renewable Energy, Zahedan, Iran (31st October-1st November 2016)

The Regional Expert Meeting on 'Renewable Related Energy Focusing on Microalgae Technology Using Ocean Resources including Solar and Fuel Cell' was held from 31st October to 1st November 2016, in Zahedan, Iran. The event was organized by COMSATS in collaboration with its Centre of Excellence in Iran, the Iranian Research Organization for Science & Technology (IROST), as well as the University of Sistan and Baluchestan, Iran. The latter was also the host of the event that was attended by over 50 participants belonging to Iran, Bangladesh, Kazakhstan, Syria and Spain.

The event was inaugurated on 31st October 2016 by H.E. Mr. Ayatollah Solimani, Representative of the Supreme Leader of Iran in Sistan and Baluchestan. During his address, Mr. Solimani extended warm welcome to the foreign and local

H.E. Mr. Ayatollah Solimani, Chief Guest of the Inaugural Ceremony, Delivering his Inaugural Address

Technical Session of the Regional Expert Meeting on Renewable Related Energy

Participants of the Regional Expert Meeting on Renewable Related Energy

subject experts for participating in the event. He informed that there is an abundance of renewable energy resources in Iran, and the country is actively engaged in research and development activities in the field of solar and wind energy. He called for greater cooperation among the developing countries for making best use of the available renewable energy resources.

Earlier, Prof. Dr. Alireza Bandani, President of University of Sistan and Baluchestan, Iran, expressed pleasure on hosting the event, and welcomed local and foreign speakers and participants. Highlighting the need of enhanced capacity-building in the field of renewable energy, Prof. Bandani welcomed the technical collaboration of the participating institutions with his university.

Speaking on the occasion, Dr. M. Molanejad, Acting President for International Cooperation, IROST, called for increased collaborations in the field of renewable energy with a view to finding better substitutes for fossil fuels. Prof. Nasrin Moazami, IROST, Iran, apprised the audience about the ongoing research activities in Iran in the field of renewable energy, particularly about the research on energy generation from microalgae. She also informed the participants regarding the objectives of the foundation meeting of COMSATS' International Thematic Research Group on 'Renewable Energy' that was held on 2nd November 2016 (reported in earlier part of this newsletter).

Representing COMSATS, Mr. Farhan Ansari, Sr. Assistant Director (Programmes), stated that the role of energy in socio-economic development of countries is very significant. He stressed the need for enhanced collaboration in the field of renewable energy among the developing countries, in general, and COMSATS' Member States, in particular.

The two-day event included six technical sessions comprising 21 technical presentations and invited lectures in all on different topics related to the theme of the event. The presentations made during the event, inter alia, related to: assessment and market development of wind energy resources in Iran; market of renewable energy in Spain; research on semiconductor optoelectronics and nanophotonics in Kazakhstan, genomic cosmetics and microalgae; bio-fuel production from high energy crops adapted to hot and dry climate; research on photovoltaic systems in Syria; research on solar thermal energy in Iran; study on wave energy resources in Iran; emerging solar energy technologies in Bangladesh; microalgae bio-refinery established in Iran; recent advances in proton-exchange membrane fuel cells in Iran; developments of microbial fuel cells for energy generation and wastewater treatment; research on sold oxide fuel cells in Iran; potential of production of second generation bioethanol in Iran; techno-economic development of solar thermal concentrating power plant; challenges with heating and ventilation systems in the residential near-zero energy buildings; and successful experiences of solar energy in the world.

The recommendations of the expert meeting that concluded on 1st November 2016 advocated promotion of renewable energy technologies and development of this sector in COMSATS' Member States. These, inter alia, called for:

- making best use of the abundant renewable energy resources available in the developing countries;
- ensuring adequate, reliable, affordable, equitable and sustainable supply of renewable energy to various sectors of the economy for national development;
- accelerating the process of acquisition and diffusion of technology;
- managerial expertise and private-sector participation in the renewable energy sector;
- promoting investments and technology development in the sector;
- fostering international cooperation and trade in the sector; and
- strengthening the training institutes for renewable energy.

S&T INDICATORS OF A MEMBER STATE

In Spectrum: Republic of the Sudan

The Republic of the Sudan is a sovereign state located in Northern Africa. It is a democratic, decentralized, multi-cultural, multi-racial, multi-ethnic, multi-religious, and multi-lingual country. The country shares borders with Egypt to the north, the Red Sea, Eritrea, and Ethiopia to the east, South Sudan to the south, the Central African Republic to the southwest, and Chad to the west and Libya to the northwest. The River Nile divides the country into eastern and western halves. It now is the third largest country in the continent with geographic area of 1.88 million sq. km. The northern part of the country is desert, spotted with oases, where most of the population is concentrated.

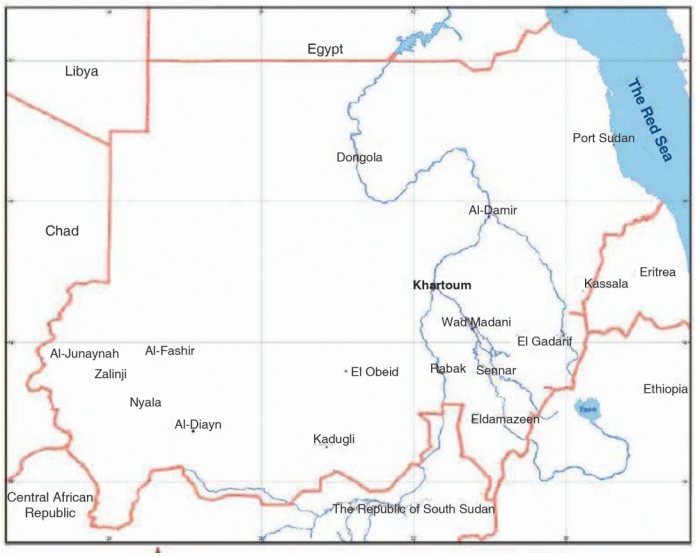
On January 1, 1956, Sudan gained independence. Once geographically the largest state in Africa, Sudan split into two countries in July 2011 after the people of the south voted for independence. Various outstanding issues, especially the question of shared oil revenues and border demarcation, have continued to create discussions between the two successor states.

The supreme law of the land is its 'Interim National Constitution', which was adopted on July 6, 2005 and was drafted by the National Constitutional Review Commission, as mandated by the January 2005 Comprehensive Peace Agreement (CPA). Sudan is a presidential representative democratic republic. As per the constitution, the National Executive consists of the Presidency of the Republic and the National Council of Ministers. The Presidency of the Republic comprises of the President and two Vice Presidents, whereas the President is directly elected by the people in national elections. The President after consultation within the Presidency appoints the National Council of Ministers.

As articulated in the country's constitution, the State shall mobilize public, private and popular resources and capabilities for education and development of scientific research, especially Research and Development.

As per the World Bank estimates, the population of Sudan was over 40.2 million in 2015. The annual population growth rate of Sudan peaked in 1993 at around 4.6%, while over the last decade it remained between 2.1% and 2.6%. The largest segment of the Sudanese population (39.43%) is under the age of 14, followed by population segment (32.42%) aged between 25 and 54 (CIA World Factbook).

According to the Human Development Index, Sudan ranks at 167 out of 188 countries with a HDI value of 0.479 (UNDP Human Development Report, 2015). Between 1990 and 2014, Sudan's HDI value increased from 0.331 to 0.479, an increase of 44.7 percent or an average annual increase of about 1.55 percent. Table-A indicates Sudan's progress in each of the HDI indicators.



Between 1980 and 2014, Sudan's life expectancy at birth increased by 9.3 years, mean years of schooling increased by 2.2 years and expected years of schooling increased by 3.1 years. Sudan's GNI per capita increased by about 137.8 percent between 1990 and 2014.

The reported public expenditure on education in the country is 2.2% of the GDP (World Bank, 2015). The adult literacy rate in 2015 was 73.4%, whereby primary, secondary and tertiary gross enrolment ratios were 70%, 41% and 17%, respectively.

According to African Development Bank Group, Sudan's economic growth rose to over 5% in 2015 and is expected to increase further to above 6% in 2017. Agriculture and livestock are essential to Sudan's economic diversification (away from oil) and could contribute to medium-term macroeconomic stability. These sectors could contribute significantly with greater investment (World Bank 2015). Sudan now has greater focus on agriculture and livestock, as reflected in its Interim Poverty Reduction Strategy Paper (I-PRSP) and the Five-year Programme for Economic Reforms approved by its parliament in December 2014.

Table A: Sudan's HDI Trends Based on Consistent Time Series Data

Year	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2011 PPP$)	HDI value
1980	54.2		0.9		
1990	55.5	3.9	1.5	1,602	0.331
2000	58.0	5.6	2.4	2,108	0.400
2010	62.1	7.1	3.1	3,032	0.465
2014	63.5	7.0	3.1	3,809	0.479

Source: *Human Development Report 2015, UNDP*

The agriculture sector contributes 28.6% to GDP (World Bank 2015 estimates), while the industry and services sectors contribute 20.5%and 50.8%, respectively. The balance of trade has been negative as import of goods and services as percentage of GDP (12.1%) is nearly double than the export (6.9%).

Major agricultural products of the country include: cotton, groundnuts (peanuts), sorghum, millet, wheat, gum arabic, sugarcane, cassava (manioc, tapioca), mangoes, papaya, bananas, sweet potatoes, sesame seeds, animal feed, sheep and other livestock, while its major industries are oil, cotton ginning, textiles, cement, edible oils, sugar, soap distilling, shoes, petroleum refining, pharmaceuticals, armaments, automobile/light truck assembly, and milling.

Sudan's Ministry of Science and Technology was established in 2001 with an aim to contribute effectively to harness scientific research, science and technology for the development of natural resources and achievement of economic and social development. Other key commissions of the Ministry were transferring and settling appropriate technologies and taking care of and upgrading local technologies, rehabilitating infrastructures, introducing more modern equipment and developing human resource. In 2011, the Government of Sudan gave the portfolio of science and technology (S&T) to the Ministry of Science and Communication.

After four years in 2015, the Sudan's Ministry of Higher Education (MOHE) was given the ST&I portfolio. The same year, the Scientific Research and Innovation Commission was established as an executive arm under MOHE. Also Scientific Research, Technology and Innovation Council has been established in 2016 to facilitate building scientific culture in the country. Currently, several institutions form the public sector driven ST&I ecosystem of Sudan, which include, among others, the National Centre for Research (NCR); National Food Research Centre (NFRC); National Solar Energy Research Centre (NSERC); the Sudan Atomic Energy Commission (SAEC); and Sudan Academy of Sciences (SAS). This ecosystem also has the support of large business conglomerates including GIAD, DAL, and SAFAT. The Industrial Research and Consultancy Centre (IRCC), Khartoum, Sudan, augments the industrial wing of the S&T ecosystem of the country. IRCC is also the COMSATS' Centre of Excellence in the country.

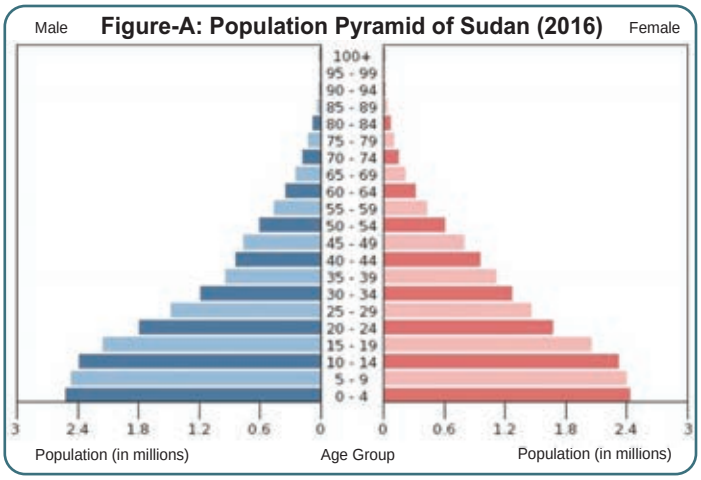


Figure-A: Population Pyramid of Sudan (2016)

IPP.Stats (a portal developed by OECD and WB) indicates that the country's last recorded Gross Expenditure on R&D (GERD) stands at 0.3% of GDP. For a country like Sudan that has a decent infrastructure of academic and research institutions (as indicated in the following interview of the Ambassador of Sudan in Islamabad), Sudanese government needs to increase GERD in order to enable the country to benefit its economy and accelerate the national development.

Given the immense challenges of development, Sudan needs to improvise a National Strategy allocating more resources to science-led socio-economic uplift of its people.

Key Development Indicators of Sudan

Development Indicator	1990	2000	2010	2015
Total Population (Million)	20.0	28.1	36.1	40.2
Urban population growth (annual %)	8.0	2.6	2.6	2.8
Agriculture, value added (% of GDP)	40.6	42.2	24.6	28.6
Industry, value added (% of GDP)	15.3	20.8	28.4	20.5
Services, etc., value added (% of GDP)	44.2	37.0	47.0	50.9
Exports of goods and services (% of GDP)	4.0	16.0	19.7	6.9
Imports of goods and services (% of GDP)	7.1	13.4	17.2	12.1
Goods exports (BoP, current US$ Million)	326.5	1,806.7	11,404.3	3,169.0
Goods imports (BoP, current US$ Million)	648.8	1,366.3	8,839.4	8,367.6
Trade (% of GDP)	11.1	29.4	37.0	19.0
Manufacturing, value added (% of GDP)	8.7	8.6	5.9	7.8
Mobile cellular subscriptions (per 100 people)	-	0	42	71
Internet users (per 100 people)	-	0	17	27
High-technology exports (% of manufactured exports)	-	3.8	0.2	-
ICT goods exports (% of total goods exports)	-	0.02	0.01	-
Merchandise trade (% of GDP)	8.0	27.4	32.7	13.8
Scientific and technical journal articles	69	64	310	-

Source: *World Bank Indicators, 2015*

An Interview with the Ambassador of the Republic of Sudan to Pakistan H.E. Mr. Tajeldin Elhadi Eltahir

Please briefly introduce Sudan as an important member of the world community and highlight the vision of the Government of Sudan for sustainable national development and the role it envisages Science, Technology and Innovation to play for its development.

Sudan is one of the richest countries with many resources and vast opportunity for technological renaissance. These resources are supported by large number of universities, colleges and R&D institutes, i.e., about 135 universities, university colleges, and colleges and more than 200 R&D organizations. Recently, a huge increase in the number of STI students has been secured by the Government of Sudan, i.e., about 166 thousand per year admitted to various levels of education, especially higher studies internally and externally.

The existence of infrastructure for some industries, such as GIAD, DAL and SAFAT, is being used as great base for STI initiatives. The impressive growth in the information and communication technology (ICT) sector was also one of the great levers for STI, i.e., (5^{th} G was recently released in many territories in the country). On the other hand, production of renewable energy through construction of many dams with high level of water storage in the Nile valley open the door for many international investments which slowly move the country to technological renaissance.

Much of Sudan's scientific and technology development is a result of its detailed policies, plans and recommendations for scientific research, technology and innovation developed in early 70s were at the national level in the National Research Council (NRC).

However, with the vast number of research activities at universities and national research centers adding to that the new vision of STI with many new national and global factors, Sudan needs to develop new and fresh national policy for Science and Technology and Innovation. Revision of these policies was done based on Sudanese President's initiative, which was proposed in 2009 to the United Nations Educational, Scientific and Cultural Organization (UNESCO). It was based on a few objectives:

- To enhance the role of knowledge in the economy;
- To strengthen role of partnerships between research, development, and innovation at universities and R&D centers on one hand and between industries and services organizations at the other hand;
- To stress on the impact of the innovation in the sustainable development;
- To promote demand of R&D and innovation at the state level and increase STI awareness among public;
- To transfer knowledge into wealth through R&D and innovation;
- To develop scientific curriculum and conversion of some universities and institutes to be STI oriented and have the vision to transfer the students from the job seekers to opportunity generators. Change their attitude, even in the stages of pre-graduation and basic education, to be R&D oriented, initiative, creative, and innovative, entrepreneur and leaders.

What major achievements have been made in terms of Science and Technology during the last 10 years?

The council of Ministers of Sudan approved a new SSTI policy which is in the process of being translated into strategies and plans of action with clear priorities. The Ministry of Higher Education and Scientific Research has been mandated by the Government of Sudan to lead this important issue for the future sustainable development of the country. The main components of the SSTI are:

i. Building a knowledge society by integrating science, technology and innovation with national development policies and strategy of economic reform in Sudan.
ii. Developing a culture of science, technology and innovation at the grassroots level.
iii. Improving surveillance and foresight and forward-looking system.
iv. Warding off the risk of environmental threats to the optimum use of natural resources.
v. Promoting research in the energy, modern technologies, bio-technologies, space sciences, renewable energies and informatics areas.
vi. Focusing on research programmes and projects with a direct impact on development.
vii. Developing, localizing and deployment of technology in the industry systems in the public and private sector

organizations.
viii. Cooperation and participation in the relevant research organizations locally, regionally and internationally relationships.

What is the existing S&T capacity of the country in terms of skilled human resource, number of S&T /R&D institutions, laboratories, scientific publication, revenues through patents, etc?

Sudan currently has 122,530 PhDs and 223,780 M.Sc degree-holders. The country has 25 S&T/R&D institutes, 35 public universities and 95 private universities. Sudan's public-sector S&T Organizations work under the country's Ministry of Higher Education.

What has been Sudan's performance in achieving key MDGs, and what are the country's aspiration or SDGs?

Sudan's efforts for meeting the MDGs and to further meet the SDGs pertain to:

i. Alleviating poverty, by improving productivity and reducing the production costs based on sound research and development;
ii. Prioritizing science, technology and innovation in the country's strategic and action plans;
iii. Identification of priorities for scientific and technological research in line with the 17 SDGs and directing resources accordingly, with emphasis on the problems caused by climate change and finding solutions while preparing the plans and programmes of STI;
iv. Supporting scientific research oriented for maximizing outcomes from available natural resources;
v. Encouraging information and communication services providers to expand the coverage area to include rural and remote areas and work to reduce the cost of information development;
vi. Strengthening linkages between public and private sectors to build genuine partnerships between research, industry and services organizations;
vii. Encouraging publications in prestigious world scientific journals and upgrading local scientific journals;
viii. Developing local critical mass' capabilities in the foreign languages to help them easily understand and adopt other nations' STIs;
ix. Intellectual property rights protection for researchers and research institutions;
x. Utilization of Sudanese diaspora in the field of science, technology and innovation (STI);
xi. Collaborating and sharing of experiences with other countries at regional and international levels;
xii. Strengthen cooperation with regional bodies and the relevant organizations of the United Nations;
xiii. Supporting and strengthening the scientific and research institutions;
xiv. Development of science, technology and innovation curriculum in public education at under-graduate and graduate levels.

Sudanese STI tools and mechanisms employed in this regard include:

i. Review and update of the structure of scientific research, innovation and technology development, plans, policies and strategies.
ii. Establishment of new bodies that complete the SSTI cycle from grass-roots researchers up to industry if needed;
iii. Development of a policy for utilization of research funds with allocation of at least 1% of the total gross domestic product (GDP) to fund Sudan's STI programmes and projects, while looking forward to reach the desired ratio of 2% adopted by UN agencies;
iv. Developing incentive legislation for private sector to participate and invest in development of technologies and human expertise (legislations that include legal, and financial aspects, etc.);
v. Initiate technological cities, incubators, and S&T parks;
vi. Promotion of scientific publications and researchers, research institutions, research groups, outstanding innovators and graduate students;
vii. Introduction of an attractive incentives and rewards system (including financial) for good projects and programmes outcomes for STI;
viii. Injecting R&D and technology development fund in foreign loans and grants provided to Sudan government.

South-South Cooperation is considered important for national and regional progress of the developing countries. How is Government of Sudan employing this mechanism in its development agenda?

The country is considering collaborating with other countries and organizations for South-South cooperation in three regions: Africa, Asia, and OIC countries.

In which specific areas of Science and Technology does the Government of Sudan need support of international community? Kindly share some collaborative arrangements in this regard.

Sudan is a member of the following international S&T organizations:

- African Science, Technology Innovation Indicators Initiative (ASTII);
- African Ministerial Conference on Science and Technology (AMCOST);
- United Nations Economic and Social Commission for Western Asia (UN-ESCWA);
- COMSATS.

ACTIVITIES/NEWS OF COMSATS' CENTRES OF EXCELLENCE

CIIT-Pakistan holds 14th International Conference on Frontiers of Information Technology (FIT-2016)

A regular event of COMSATS Institute of Information Technology (CIIT), the 14th International Conference on Frontiers of Information Technology, was held on December 19 to 21, 2016, in Islamabad, Pakistan.

The 14th event of this series of conferences was sponsored by the Ministry of Science and Technology, Government of Pakistan; Higher Education Commission of Pakistan; and National Testing Service (NTS), Pakistan. The conference was technically co-sponsored by IEEE Computer Society (IEEE CS), IEEE Industrial Electronics Society (IEEE IES), IEEE Islamabad Chapter.

The Conference was of a blend of different events, including Keynote Addresses, Invited Talks, Tutorials, Workshops, as well as Ph.D Symposium, Best IT Innovation Award (BITA), Project Exhibition and Panel discussion. Prof. Dr. Hermann Maurer of Graz University of Technology, Austria, delivered the Keynote Address, titled "New Technologies have the Potential to Change our Lives Completely".

A total of 330 technical papers were received from various countries around the globe, out of which 74 papers were accepted after a thorough blind peer review process. A total of 35 technical sessions were held and chaired by renowned academicians. Moreover, 20 invited talks were delivered on the latest trends in the areas of computer sciences and electrical engineering. The invited speakers, representing academia and IT industry from different countries, belonged to Australia, Indonesia, Kuwait, Norway, Pakistan, Portugal, Russia, South Korea, Turkey, UAE, UK, and USA.

The Ph.D symposium encouraged the young researchers to share their on-going research. Out of the 104 submissions made under the competition for Best IT Innovation Award, the project proposal entitled 'Sinoser' was declared winner. Under the Undergraduate Project Exhibition, 42 projects were displayed by the students from seven CIIT Campuses. Cash prizes were awarded to top three projects developed by the students of Computer Science and Electrical Engineering Departments.

Chairman Board of Governors CIIT, Mr. Fazal Abbas Maken, Addressing the Audience at FIT-2016

The Chairman of the Board of Governors, CIIT and Federal Secretary Ministry of Science and Technology, Mr. Fazal Abbas Maken, graced the Closing Ceremony of the conference as the Chief Guest.

ITI-Sri Lanka Launches New R&D Complex

The Industrial Technology Institute (ITI), Sri Lanka, launched its Modern Research and Development Complex (MRDC) on 8th December 2016, in Malabe, a suburb of Colombo, which is the designated Science and Technology belt of Sri Lanka. Minister of Science, Technology and Research, Hon. Susil Premajayantha graced the occasion as the Chief Guest. The Guest of Honour, Hon. Laxman Senawiratne, State Minister of Science, Technology and Research, Officials of the Ministry, Heads of other Sri Lankan R&D institutions and many other distinguished guests were also present at the occasion.

Upon completion, the MRDC is going to be a full-fledged research and development complex. Currently, the Complex houses the Herbal and Food Technology Laboratories, Pilot Plant and the Administration section in three newly built buildings. All these laboratories and the pilot plant are equipped with state-of-the-art facilities. Industrial scale production can be carried out at the new pilot plant.

The construction of the next phase of the MRDC will start soon and a Centre of Excellence for Biotechnology and a joint China-Sri Lanka Biotechnology Laboratory will be set up in this facility.

BCSIR-Bangladesh Holds Capacity-Building Events

Bangladesh Council of Scientific and Industrial Research (BCSIR), Bangladesh, organized the International Conference on Engineering Materials and Metallurgical Engineering (ICEMME 2016) from 22nd to 24th December 2016 with the support of its Pilot Plant and Process Development Centre (PP&PDC). The theme of the conference was Materials for Energy, Environment and Health. Delegates and researchers from Australia, Korea, Japan, Malaysia, India and Bangladesh attended the conference.

On 22nd December 2016, the 1st Technology Business Model Workshop was also organized by the Centre for Technology Transfer and Innovation of BCSIR. Ten representatives from

different industries, such as Globe Capsule Ltd., Gazi Group, Amrito Food Products Ltd., and other entrepreneurs attended the day long interactive seasons of the event. Moderators of workshop were Dr. Mahamud Osman Imam, Professor-Department of Finance, University of Dhaka, and Dr. Kamal Uddin, Professor and Director, Institute of Appropriate Technology, Bangladesh University of Engineering and Technology (BUET). Mr. Rezaul Karim, Project Director and Principal Scientific Officer also contributed to the workshop as technology solution provider. The training imparted at the workshop focused on use of technology for viable products, opportunity mapping and company wise implementable solutions.

Al-Farabi KaZNU, Kazakhstan, Strengthens Cooperation with Elsevier

On 29th November 2016, a meeting was held between the Rector of the Al-Farabi Kazakh National University (KaZNU), Prof. Galym Mutanov and the Vice President of Elsevier, Mr. Gino Ussi.

The two organizations have mutually beneficial cooperative ties since last five years that led to a significant increase in the publications of university scientists in international journals. This manifests in the Scopus statistics that show that the number articles by KazNU scientists in top journals have increased 3.3 times - from 96 to 319 during 2011-2015.

Elsevier and KazNU proposed cooperation on promoting 5 scientific journals in the English language and 17 series of “Vestnik KazNU” in “Scopus” database. Mr. Gino Ussi supported this proposal and expressed readiness to provide assistance and support for inclusion of KazNU scientific journals to the largest database in the world. Promotion of KazNU journals in Scopus database will undoubtedly contribute to further development of science in the country, as well as introduce the world community with the achievements of the country's scientists.

Rector of KaZNU, Dr. Galym Mutanov, and Vice President of Elsevier, Mr. Gino Ussi

Al-Farabi KazNU closely cooperates with other leading international agencies pertaining to scientific and metric databases such as: Web of Science, and Thomson Reuters, as well as with major publishing houses of the world, including Nature, Springer, Taylor & Francis, Wiley, and Oxford University Press.

ICCBS-Pakistan becomes UNESCO’s Category-2 Centre

On 21st November 2016, an agreement was formalized by UNESCO’s Director-General, Dr. Irina Bokova, and the Director of the International Center for Chemical and Biological Sciences (ICCBS), Dr. Muhammad Iqbal Choudhary, to establish ICCBS as UNESCO’s Category-2 Centre. The decision to place ICCBS under the auspices of UNESCO as a Category-2 Centre was approved during the 38th General Conference of the Organization.

The Director General expressed her appreciation for ICCBS, the quality of science and scientists and concentrated the Center’s efforts for South-South cooperation.

ICCBS is regarded as one of the developing world’s finest research and training centres in chemical and biological sciences, conducting cutting-edge interdisciplinary research for the discovery of important chemical compounds from plants and antioxidants, as well as exploring innovative methodologies for the synthesis of novel agents and proteins used in drug discovery and biotechnology.

President of TÜBİTAK MAM, Turkey, Advocates Smart Mobility for a Better Future

Dr. Bahadir Tunaboylu, the President of TÜBİTAK Marmara Research Center (MAM), Turkey, delivered a talk on Smart Cities and Mobility at the World Automotive Conference, held in Istanbul on November 29-30, 2016. In his talk, Dr. Tunaboylu highlighted TÜBİTAK’s mission to make Turkey a leading country in smart mobility.

Dr. Tunaboylu informed that Turkish Automotive Center of Excellence was established as part of TÜBİTAK MAM in 2015 with a view to applying advanced technologies on smart transport systems and creating added value by offering these solutions to local and global industries.

He also briefed the participants on ‘Smart Mobility Cluster’ led by TÜBİTAK MAM that focuses on Smart Vehicles, Internet of Things and Continuous Data Collection. The cluster is working towards solving mobility problems in congested urban areas, especially in Istanbul.

POTENTIALS OF BIOMASS AND BIOFUELS IN THE DEVELOPING COUNTRIES: PROSPECTS AND CHALLENGES

Dr. Abdulrahim K. Saad*

It is believed that the shortages of conventional fuels are increasing due to the high energy demand in both developing and developed countries. Therefore, there is an urgent need to harness renewable energy sources that are crucial to maintain at least the current level of consumption. Developing countries can benefit from renewable energy resources such as biomass, solar, geothermal, ocean. These energy resources can play a vital role in ameliorating optimal energy supply in the developing countries. Research shows that biomass sources have many advantages as they can provide appropriate means to storing energy contrary to other renewable sources. Accordingly, developing countries must provide strong incentives to develop alternative biomass energy sources.

To date, developing countries have been widely using the traditional biomass fuels, such as charcoal, fuelwood, manure, crop residues, and these resources are still considered as the major heating and cooking fuels for many dispersed, poor and rural populations. In this article we are going to discuss a new trend of getting biomass energy, focusing mainly on biofuels which are defined as the fuels (liquid or gaseous) that are derived from biomass especially plant biomass such as wood, energy crops, forestry and agricultural wastes etc. The major biofuels produced so far include ethanol, biodiesel, fuel gases, and bio oil.

Biofuel production is growing rapidly and has tripled since 2005. It provides for around 1.5% of the global transport fuel. The ambitious policies and programmes of developed countries, e.g., United States, Canada, and European countries have largely driven the development of biofuels. This trend for many developing countries is generating new opportunities. It has been argued that developing countries could be significantly more competitive than developed countries in terms of biofuel production due to the availability of cheap agro-ecologically land appropriate for the cultivation of biofuels feedstock. The trend of biofuels production could provide developing countries with opportunity of investment that however will face some challenges.

A good example of a successful developing country that shifted to alternative biofuels is that of Brazil. In 1970s, during the global oil crisis, the economy of Brazil was negatively affected due to the country's heavy reliance on oil import. As a result, the government planned to put in place some programmes and new policies to decrease the reliance on imported oil. These policies and programmes involved great investments to develop alternative energy sources, besides producing domestic oil. Then Brazil continued its programmes by investing in alternative energy till the situation totally changed. As a result of implementation of these policies over the years, Brazil is now a leader in biofuels production and is considered to be the world's first sustainable biofuels economy as well as the second largest producer of bio-ethanol in the world. Brazil's energy policy thus become a model for many countries. It is evident from this example that developing countries should consider reducing their dependence on conventional energy sources as a part of their development plans and work together to increase the role of biomass and new bioenergy technology in the global energy supply.

Biomass energy as a petroleum substitute is an attractive trend that may have a considerable potential, particularly in countries with available unused arable lands. In developing countries, petroleum energy is mainly used for industrial applications, power generation and transportation fuels. For using biomass energy in these areas, a conversion of biomass is firstly required to obtain a suitable form for it to replace the petroleum products and easily transported.

The availability of biomass resources in developing countries would create a good opportunity for getting significant renewable feedstocks for producing biofuels. Based on the biomass resources, they can be converted to first-generation biofuels and second-generation biofuels. The most important biofuels of the first generation are bioethanol and biodiesel, which have been so far produced across several countries. The bioethanol here is derived from starch crops or sugar by fermentation (e.g., sugar cane, sugar beet, cassava, wheat, maize, or sorghum), whereas the biodiesel is obtained from vegetable oils (e.g., soy bean, palm oil, castor beans, rapeseed oil, musine or jatropha) by esterification or trans-esterification reaction of the oil with methanol in a base catalyst. Bioethanol can either be used as a blended form with petroleum fuel, or directly in specially designed engines. Similarly, biodiesel can either be used blended with the conventional diesel or directly in diesel engines. The second-generation biofuels are mainly derived from lignocellulosic biomass materials, such as forest

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residues, timber and agricultural residues. The interest in second-generation biofuels is growing and they might become competitive by 2020.

The conversion of biomass to biofuels can be achieved using a number of process technologies, such as biochemical, chemical and thermochemical technology. The biochemical conversion technology mostly uses microorganisms referring principally to aerobic, anaerobic and alcoholic fermentation processes to get liquid or gas biofuels, such as biogas, and ethanol. Additionally, the chemical conversion technology of biomass refers to acid and enzyme degradation (hydrolysis), which provides a potential source of biofuels with added-value chemicals, such as, ethanol, furfural and reducing sugars. Furthermore, the thermo-chemical process has received special attention because it has higher efficiencies comparing to chemical/ bio-chemical processes. The thermal conversion can be widely used in developing countries, especially for utilizing the lignocellulosic biomass materials to produce liquid, gases and solid biofuels through three main routes: liquefaction, gasification and pyrolysis. In addition to that, there must be some considerations for many of these technologies, such as customizing the technology system to suit the local conditions, building up necessary research & development capacity, getting the assistance and consultancy of the developed countries by proving technical and financial aids, and facilitating free technology transfer.

Several developing countries have great potential to increase biofuel-production from forestry and agricultural products, creating employment, and to collaborate with the world community to reduce GHG emissions. The wood from forests can be a good option to satisfy the future energy demand. In several developing countries, wood energy can compete with fossil energy, particularly for countries with large forest areas, such as Brazil, China, Argentina, and Indonesia.

The choices now are open to the developing countries to substitute petroleum energy. The success of the various technologies mentioned in this article will rely on some of the important points mentioned as follows:

- Bioenergy development must initially explore opportunities based on proven technologies rather than developing new ones;
- Trained manpower, foreign exchange and capital that is available;
- Availability of alternative biomass energy sources in developing countries;
- Bioenergy development should explore opportunities based on already available biomass rather than investing in dedicated fuel crops;
- Large bioenergy projects need widespread land areas, therefore the competition between land for food-production and energy should be assessed;
- Availability of unused land and its suitability for growing energy crops;
- Economies of scale;
- A joint R&D collaboration with expert companies in the field is required; and
- Effective joint ventures with international companies.

In order to assess the technologies and get an effective policy decision, the governments must have sound planning and development capacity, and also prioritize building indigenous research capacities. Also, strategies of developing countries must consider collaborating with the countries having enormous potential to produce biomass energies with lower risks and investments.

Developing countries, such as China, Brazil, and Thailand, have already begun producing first-generation biofuels. Brazil as mentioned earlier has been a leader in biofuels production for few years and has developed sufficient infrastructure, such as fuel stations and vehicles that can use ethanol and gasoline. Developing second-generation biofuel is being undertaken by only a few developing countries and that too just at the R&D level. However, it is predicted that cost of biofuels production will come down allowing developing countries to shift quickly to some attractive feedstocks enabling the production of second-generation biofuels, such as ethanol from cellulose, crop residues, wood wastes, forest products and energy crops. The abundance, widespread availability, low-cost processing of biomass for energy generation as well as its significant role in helping reduce GHG emission make them attractive and appropriate options for biofuel production.

To sum up, biofuels hold a number of promising prospects for the developing countries; however they also pose some serious challenges. First, the impact on soil and water must be considered as the biofuels crops highly consume water. For instance, some tropical crops, such as jatropha, sugar beet and sugar cane, require plenty of water and fertilisers that may cause water pollution. Moreover, the expansion of large-scale biofuels may create deforestation. For instance, the tremendous expansion in palm oil growth in South East Asia for biofuel may threaten biodiversity and the local community that depends on it for their livelihoods. In addition to that, the issue of food security due to biofuel production and the resulting rises in prices of food-stocks must be considered. Also investment in R&D is a great challenge in developing countries and we must strengthen the research on all sources of renewable energy.

In conclusion, to handle the challenges of biofuel production in developing countries, a strong policy framework with an appropriate institutional support and massive investments in agricultural research is needed.

SCIENCE, TECHNOLOGY AND DEVELOPMENT

Research in Traditional Medicine in Africa on the Rise

The Nigerian government is trying to boost research in traditional medicine (TM) to preserve the indigenous knowledge *(SciDev.Net, December 6, 2016)*. The Nigerian President, Olusegun Obasanjo, launched a new committee on TM in Abuja, Nigeria, in December 2016, to develop, promote and commercialize TM products, in the country that could help earn at least US$1 billion over a period of a decade to contribute to the global market of TM worth US$60 billion. The committee has also been urged to set-up training and research institute in the field. More efforts in this regard would include commissioning of a book, to be released in September, which collects 1,050 research efforts by Nigerian scientists, published in 1,020 international journals since 1972. Extracts from plants and animals from different parts of Nigeria have been found to be useful for treating diseases, such as malaria, diabetes, epileptic lesions, dementia, sickle cell disorders and inflammation.

Another initiative, in this regard, has been taken by Kenya Medical Research Institute (KEMRI), which is working with the traditional healers of Kenya on the next malaria 'wonderdrug' *(SciDev.Net, December 13, 2016)*. The search for such a drug is motivated by the fact that the malaria parasite could develop resistance to established drugs. Ninety per cent of deaths from malaria occur in Africa, most of which are of children. The plants brought in by local healers are tested at the KEMRI's Centre for Traditional Medicine and Drug Research, headed by Dr. Geoffrey Rukunga. Botanists at Kenya's National Herbarium are consulted to ensure correct classification of these plants. Thousands of plants have been tested in the search for anti-malaria compounds safe enough to be turned into a commercial drug. KEMRI scientists first separate and test hundreds of likely plant components and expose them to the malaria parasite under laboratory conditions — a process known as *in-vitro* screening. The compounds are then tested on animals infected with malaria, before they can be considered for human trials. While this process is considered promising, the scientists are faced with some constraints related to funds, technical facilities, and intellectual property. Dr. Rukunga expects to discover a lead compound within two years that could be handed over to a drug developer.

A New Report to Provide Reliable Climate Data on Africa

According to a *SciDev.Net* news (December 5, 2016), a new report could help decision-makers in Africa get reliable scientific information to aid planning related to climate change in Africa, which has serious implications for agriculture, energy, and water management for this already resource-challenged region. The report, entitled Future Climate for Africa (FCFA), provides much needed information in view of the insufficient relevant literature. The report has been developed under a five year programme that began in 2014 with funding from the UK Department for International Development (DFID) and the UK's Natural Environment Resource Council (NERC).

According to the report, the relevant ministries could be using inaccurate data largely based on wrong assumptions. The report has 15 factsheets covering specific regions, including East Africa, Southern Africa, Central Africa and West Africa as well as six countries: Malawi, Rwanda, Senegal, Tanzania, Uganda and Zambia.

Bacterium to Fuel Recycling Revolution Discovered

According to a report of *Science Daily* (December 22, 2016), a team of researchers, led by Dr. Yilin Hu, Assistant Professor of Molecular Biology & Biochemistry at the Ayala School of Biological Sciences, University of California (UCI), Irvine, have reported first successful bacterial *(Azotobacter vinelandii)* expression of the reductase component of the nitrogenase enzyme. The researchers were able to convert greenhouse gas CO_2 to CO directly using this bacterium. Hu and his group demonstrated how the intracellular environment of this bacterium effectively support the conversion of CO_2 into CO, which makes it an attractive whole-cell system that could help pave the way for large-scale production of CO. The researchers were surprised to find *A. vinelandii*, previously known for being capable of reductively assimilating atmospheric nitrogen via an oxygen-sensitive, particulate nitrogenase, could reduce CO_2 and release CO as a product. This discovery can open up new avenues for biotechnological adaptation into a process that effectively recycles the greenhouse gas into the starting material for biofuel synthesis.

Novel X-ray Imaging Technique with Potential for Breast Cancer Diagnosis and Bomb Detection

An international collaborative research study on X-rays, led by the University College London (UCL), UK, revealed new advancement in X-ray technology (phase-contrast X-ray imaging), which can be used in identifying tumours in living tissue and even in detection of small cracks and defects in physical substances (*Science Daily, December 13, 2016*). The five-year project funded by the UK's Engineering and Physical Sciences Research Council (EPSRC) has made significant breakthrough with strong potential to provide new insight into beneficial applications of X-Rays in biomedicine, security, industrial production lines, materials science, non-destructive testing, and archaeology and heritage sector.

Phase-contrast X-ray imaging is different from conventional X-ray imaging, as instead of measuring the extent to which tissues are able to absorb radiation, it examines the speed at which an X-ray is able to pass through different types of material. As a result, phase-contrast X-rays are able to detect some tissue types invisible to conventional X-ray machines, such as newly growing tumours and defects in materials.

PROFILE OF MEMBER COMSATS' TECHNICAL ADVISORY COMMITTEE

PROF. DR. SEYED HABIB FIROUZABADI, SHIRAZ UNIVERSITY, IRAN

Prof. Dr. Seyed Habib Firouzabadi is an Iranian chemist renowned for his long term devotion to chemistry education in Iran and research in the area of organic synthesis. He is currently serving as Emeritus Distinguished Professor at the Department of Chemistry, Shiraz University, Shiraz, Iran.

He was born on April 9, 1943, in Tehran, Iran, where he received his early education and did Diploma from Hadaf High School at the age of 19. From 1963, he studied at Shiraz University to do his B.Sc. (1963-1967) and M.Sc in organic chemistry (1968-1970). He proceeded to the United States in 1971 for continuing his studies in organic chemistry at the University of Pennsylvania, where he did his Ph.D. under the guidance of late Professor Michael P. Cava (1971-1974).

After higher education in USA, Prof. Firouzabadi returned to Iran to join his alma mater, Shiraz University. From 1975 to 1977, he served the university as Assistant Professor and as Associate Professor from 1977 to 1983. He was promoted to full professorship position in 1984. During his long affiliation with Shiraz University, he also served in many academic and administrative positions that include: Vice Chairman of the Chemistry Department (1975); Member of Library Committee of Shiraz University (1979-1980); Vice Dean of College of Arts and Sciences, Shiraz University (1979); Chairman of the Organic Division of the Department in 1985-1987); Member of Promotion Committee, Shiraz University (1987-1992); Dean of Mulla Sadra Library of Shiraz University (1987-1993); and President and the General Secretary of the Alumni Association (1999-2001). He also has to his credit the founding of Alumni Association of the University.

As an academic, he also contributed to Kerman University, Iran. He served as Assistant Professor (1975-1977); Associate Professor (1977-1983); and Dean of College of Arts and Sciences (1975-1978). The administrative positions he held at Kerman University include, Member Research Committee (1975-1977); Member Promotion Committee (1976-1977) and Vice Chancellor of the University (1977-1978).

Prof. Firouzabadi's research interests are in a wide range of topics related to organic synthesis, including oxidation and reduction in organic media with modern agents, use of polymeric reagents in organic synthesis, ultrasonic assisted reactions, non-solvent and aqueous media reactions, organosulfur compounds, use of heteropoly acids, polyoxometalates and solid silica chloride in organic reactions, use of triphenyl phosphine in the charge transfer reactions, and study on the reactions of hydroxyl phosphonates. Using Pd and other Transition Metals for C-C and C-Het bond formation, and nano-structured catalysts and Lewis Acid-Surfactant Catalysts (LACS) for reactions conducted in aqueous media. On the basis of his research in the aforementioned areas, he published over 320 papers in internationally reputed journals. To date, his published articles have 9,230 citations with h-index 53 and i10-index 230.

He also has been the Research Associate at University of Arizona (1986-1987); Visiting Research Scientist at American Cyanamid, Princeton, USA (1993-94); Associate Member of the Iranian Academy of Sciences (since 1991); Member of the Editorial Board of Asian Chemistry Letters, India (since 1997); National Distinguished Research Professor of Ministry of Science, Research & Technology of Iran (2003); Member of the board of editors of Scientia Iranica (since 2000); Fellow of The World Academy of Sciences – TWAS (since 2000) and its Council Member (since 2013).

Prof. Firouzabadi has trained and educated over hundred students at M.Sc. and Ph.D. levels, many of whom are well-recognized professors and scientists working in Iran and abroad.

He has been the President of Iranian Chemical Society (ICS) for the last 8 years and has been contributing to its journal, JICS, as editor for nearly a decade. In October 2008, the editorial board of JICS decided to dedicate a special issue to Dr. Firouzabadi on the occasion of his 65th birthday as well as retirement.

Prof. Firouzabad received many honors and awards in recognition of his scientific contributions and excellence. Some of these include: German Academic Exchange Fellowship - DAAD (1990); International Kharazmi Prize in Basic Research - 1st Prize (1992); Distinguished Professor of Shiraz University (1993 & 2002); Afzalipour Prize in basic sciences; the Eternal Faces Award of Iran – Chehrehayee Mandegar (2003); COMSTECH Award in Chemistry (2005); ISI 1% International Scientist Award, as well as TWAS Medal Lecture Award (2010).

The Government of Iran has recently recognized his services as the National Distinguished Professor by awarding him 'Allameh Tabatabi Elite' Award.

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COMSATS' BRIEF AND ANNOUNCEMENTS

Selected Forthcoming Scientific Events in COMSATS' Countries

17-19 February 2017	International Conference on Smart, Monitored and Controlled Cities (SM2C'2017), Sfax, Tunisia ***(www.sm2c.tn)***
9-12 March 2017	6th Pak-China Business Forum 2017, Lahore, Pakistan ***(lahore.comsats.edu.pk/PCBF/2017/)***
27-29 March 2017	1st EAI International Conference on Emerging Technologies for Developing Countries, Marrakech, Morocco ***(africatek.org/2017/show/home)***
27-29 Apr 2017	Special Pathogens and Associated Disease conference (SPAD 2017), Ishaka Bushenyi, Uganda ***(www.spparenet.us)***

20th Meeting of COMSATS Coordinating Council Cairo, Egypt, 15-16 May 2017

COMSATS is pleased to announce the convening of the 20th meeting of its Coordinating Council, in Cairo, Egypt, on 15-16 May 2017, to be hosted by COMSATS' Centre of Excellence, the National Research Centre (NRC), Egypt. The Council would review the activities of COMSATS' Network since its last meeting, follow up on the decisions and recommendations made in the previous meeting, and outline the future course of action.

For more information on the Council meeting, the members or their representatives may contact Mr. Tajammul Hussain, Advisor (Programmes) COMSATS, over his email (husseint@comsats.net.pk).

Scholarships offered by COMSATS' Centres of Excellence for Member States

COMSATS Institute of Information Technology (CIIT), Pakistan, offers 100 scholarships for students/researchers for postgraduate studies in all disciplines offered by the university at its 7 campuses, as well as five post-doctoral fellowships.

The Iranian Research Organization for Science and Technology (IROST), Iran, offers 7 Ph.D scholarships [4 fully paid and 3 partially paid (50%)] and five-post-doctoral fellowships in disciplines offered by the Organization.

The International Center for Chemical and Biological Science (ICCBS), Pakistan, offers scholarships for MS and Ph.D studies in disciplines offered by the Center.

For more details, please write to Mr. Tajammul Hussain, Advisor (Programmes), COMSATS Secretariat at husseint@comsats.net.pk.

Science Vision - Call for Papers

COMSATS invites scholarly contribution for Volume 21 of its bi-annual journal, Science Vision, which aims at highlighting the important scientific and technological developments having a bearing on socio-economic conditions of the people.

For more information, please visit the journal's website: **www.sciencevision.org.pk**

A BRIEF ON COMSATS

The Commission on Science and Technology for Sustainable Development in the South (COMSATS) is an intergovernmental organization, with its Secretariat located in Islamabad, Pakistan.

COMSATS, currently, has 24 developing countries as its members, spread across three continents, i.e., Latin America, Africa and Asia. A network, of 20 International S&T Centres of Excellence, is also affiliated with COMSATS to contribute to scientific development of its Member States. The mission of COMSATS is to help create a world where all nations are at peace with one another and capable of providing good quality of life to their populations in a sustainable way using modern S&T resources. For detailed information, please visit COMSATS' website: www.comsats.org.

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