

Special Issue Devoted to Selected Papers from the 10th Arab Academy of Sciences International Conference on "Energy and Water Sustainability"

Isam Janajreh

Masdar Institute of Science and Technology, United Arab Emirates

Editorial:

This was the 10th international conference organized by the Arab Academy of Sciences (AAS) that was held in Beirut, Lebanon, December 7–9, 2012. More than 40 papers were presented during this event dealing with various issues relating to energy and water sustainability. It was a stimulating gathering of over 70 scientists, researchers and experts from the international scientific community to exchange ideas and research findings, to pass their experiences on to others, network and establish collaborative research. Formal presentations in the two-day Conference comprised the Opening Ceremony, the Presidential Address, three Keynote Addresses, and 21 shorter papers. Panel discussions were held at the end of each of the first four Sessions. The final Session VI was a general discussion that aimed at the development of a set of recommendations. Additionally, informal discussions took place in break periods and social gatherings. In this special issue of *Int. J. of Thermal & Environmental Engineering*, twelve papers were selected, extended beyond the versions presented at the conference, and published. In these papers, a great variety of theory, applications, and methodologies in various areas of water, waste management, and energy utilization and sustainability were presented.

The editor of this special issue would like to thank the authors for their efforts in providing an extended version of their papers. Also, he would like to express his deep appreciation for the hard work and diligence of the other reviewers that helped in the reviews for *Int. J. of Thermal & Environmental Engineering*. The published papers, the established networks, and collaborative work were amongst the fruitful goals of the conference. The AAS would like to personally thank the Coordinating Editor and Editor-in Chief of the journal, Dr. Bilal Akash, for his willingness in giving us the opportunity to

edit this special issue and for his continuous support during the submission process.

After the success of the 9th Arab Academy of Sciences International Conference on The role of water and Energy on Food Security- in the 10th conference- The AAS have built on that success and called for a related but crucial theme of Energy and Water Sustainability. Conventional sources of energy are declining and to meet the global demand on energy, new but sustainable sources of cheap and abundant energy must be developed for a world heavily dependent for its stability on cheap energy. The importance and value of water is even more pronounced. The scarcity of renewable water resources make it necessary to look for means of obtaining fresh water through desalination, a process which is heavily dependent on the availability of energy. Waste is becoming a recurring problem; its management and valor is becoming a recurring theme.

The Arab Academy of Sciences, in its aim to increase scientific awareness and its role in the sustainable development of Arab society, in its capacity have organized a conference on "Energy and Water Sustainability." The conference addressed key scientific, engineering, and technological solutions relevant to the Arab Region and its people. This is a part of a series of conferences and meetings organized by AAS on topics crucial to the region that included Science Parks for the Developing World, Bridging the Digital Divide in Developing Countries, Drug Biotechnology & Medicinal Plants, and the recent, Alternative & Renewable Sources of Energy. It is the academic policy to invite international experts who usually give their time freely to participate in these conferences while trying to seek fund to accommodate and financially support their efforts.

Conference Synopsis

The Arab Academy of Sciences has been working on important sectors that are crucial to the development of the Arab world. The view is that the Arab world has been on the consuming end for very long time and that the gap with the developed countries has been widening. This presents the need to come together, share knowledge and create bridges to facilitate development. The Academy has chosen Energy and Water Sustainability as themes for this workshop because of the recognition that we live in an arid region where the need for water and use of renewable energy will be very important for the region's development.

- Formal presentations in the two-day Conference comprised the Opening Ceremony, the Presidential Address, three Keynote Addresses, and 21 shorter papers. Panel Discussions were held at the end of each of the first four Sessions. The final Session VI was a general discussion that aimed at the development of a set of recommendations. Additionally, informal discussions took place in break periods and social gatherings
- A total of 60 scientists, engineers and representatives of different entities and agencies participated in what could be described as a particularly intense meeting to discuss topics that are of specific and urgent relevance to the Arab world. A substantial proportion of the presentations was also relevant to the previous two meetings of the Academy (*Alternative & Renewable Sources of Energy and Water & Energy in Sustainable Food Security*) demonstrating the prime importance and topicality of these meetings globally and regionally. A clearly stated desire was expressed for expanding the themes of this conference in future meetings in order to discuss the latest developments that will have huge implications for the Arab world.
- An invitation was extended to participants to forward to the President and Secretary General their views on the Conference and suggestions for future actions of the Arab Academy of Sciences. The Academy functions largely by voluntary action coupled with the valued support of relatively few sponsors. Accordingly, it requires greater support that would enable the establishment of professionally run sub-sets, such as health, economics, engineering, microbiology, agriculture & horticulture, ICT *etc.*
- A website with highlights and recommendations of the meeting will be constructed in the near future. Several papers, on the basis of the presentations, will be published under the auspices of the *International Journal of Thermal & Environmental Engineering*

- Keynote lecture addressing role of nanotechnology in energy harvesting from different sources, micro-energy harvesting, desalination issues, and new technologies for combustions were presented.
- Energy efficiency was stressed in many presentations.
- Expanding renewable energy supplies, especially solar energy, was deemed as inevitable to meet future demands.
- Presentations on freshwater conservation, recycling, and water-use efficiency were made.

Conference Recommendations:

- Stress at future meetings successful energy and water programs in the Arab World. An example includes the American University of Madaba which operates using geothermal energy.
- Raise awareness of these programs among practitioners.
- Invite industries, students, practitioners from all fields related to water and energy to participate in this conference.
- Invite media to disseminate the knowledge.
- Setup standards and codes for renewable energy and water resources in the Arab World.
- Develop a database of ex-patriots who work in fields of water and energy and who can help local scientists and researchers. Having said this, there is also the recognition that there is enough intellect to come out with solutions that suit this region without the need to copy others.
- Develop policies and address the adverse effects of subsidies on the development of renewable energy.
- Raise funding to hold this conference and other workshops.
- Provide a list of technical papers that summarize the presentations.

Additionally, the following research themes have been proposed for presentation at future conferences:

- (a) Micro-energy harvesting, (b) Energy efficiency, (c) Nanotechnology in desalination, (d) Biofuel effects, (e) Potential impact on climate change, and (f) Technologies for waste treatment

A suggestion was made to hold short parallel courses/workshops on emerging new research or policy and technology in the fields of water and energy. The secretary general will work with different participants on developing strategies to meet the above mentioned recommendations.

**Tenth Arab Academy of Sciences International Conference on
Energy and Water Sustainability
Beirut, Lebanon, December 7-8, 2012**



List of Invited Speakers

Ali Abbas

School of Chemical and Biomolecular Engineering,
University of Sydney, Sydney, Australia

Muhammad Abu Zahra

Chemical Engineering Professor, Masdar Institute, Abu
Dhabi, UAE

Bilal A. Akash

Professor and Dean of College of Engineering, Dhofar
University, Oman

Darwish Al-Gobaisi

Director, International Centre for Water and Energy
Systems (ICWES), Abu Dhabi, United Arab Emirates

Amer Al-Hinai

Masdar Institute of Science and Technology, Abu Dhabi,
United Arab Emirates

Fathi Allan

Department of Mathematical Sciences, United Arab
Emirates University, Al Ain, Abu Dhabi, United Arab
Emirates

Ahmed Al-Salaymeh

Director, Energy Center, University of Jordan, Amman,
Jordan

Nadim Aziz

Chair, Civil and Environmental Engineering, Clemson
University, USA

Adnan Badran

President, Arab Academy of Sciences and President, Petra
University, Amman, Jordan

Riad Benelmir

Director, LERMAB Laboratory, Henri Poincare
University, Nancy, France

Fabiola Castro

Environmental Planning Institute, Leibniz Universität
Hannover, Hannover, Germany

Alberto Coronas

Department of Mechanical Engineering, Universitat
Rovira i Virgili, Tarragona, Spain

Latifa Dlimi

Department of Physics, Ibn Tofail University, Kenitra,
Morocco

Sherien Elagroudy

Assistant Professor of Environmental Engineering, Ain
Shams University, Cairo, Egypt

Nasir El-Bassam

Director, International Research Centre for Renewable
Energy, (IFEED), Germany

Mutasem El-Fadel

Chairman, Department of Civil & Environmental
Engineering, American University of Beirut, Beirut,
Lebanon

Mahmoud El-Solh

Director General, International Center for Agricultural
Research in the Dry Areas (ICARDA), Aleppo, Syria

Hasan Fath

Professor Water and Environment, Masdar Institute of
Science and Technology, Abu Dhabi, United Arab
Emirates

Nadim Farajalla

Department of Landscape Design and Ecosystem Management, American University of Beirut, Beirut, Lebanon

Chaouki Ghenai

Ocean and Mechanical Engineering Department, Florida Atlantic University, USA

Muhammad Hajj

Director of Graduate Studies, ESM Department, Virginia Tech, USA

Mohammad A. Hamdan

Dean of Engineering, Al-Zaytoonah Private University of Jordan, Amman, Jordan

John Hillman

Consultant in R&D Development, Former CEO of the SCRI Group, United Kingdom

Isam Janajreh

Mechanical Engineering Program, Masdar Institute of Science and Technology, United Arab Emirates

Marwan Khraisheh

Dean of Masdar Institute of Science and Technology, Abu Dhabi, United Arab Emirates

Ryan Lemand

Securities and Commodities Authority, Abu Dhabi, United Arab Emirates

Olfa Mahjoub

National Institute for Research in Rural Engineering, Tunisia

Assaad Masri

ARC-Australian Professorial Fellow, School of Aerospace, University of Sydney, Sydney, Australia

Toufic Mezher

ESM Program Coordinator, Engineering Systems and Management, Masdar Institute, Abu Dhabi, United Arab Emirates

Sohail Murad

Professor and Chairman, Chemical Engineering Department, University of Illinois at Chicago, Chicago, USA

El-Tayeb Mustafa

President, The Future University, Khartoum, Sudan

Abdullah Nuhait

Department of Mechanical Engineering, King Saud University, Riyadh, Saudi Arabia

Balgis Osman-Elasha

Climate Change Adaptation Expert, Compliance and Safeguard Division, African Development Bank, *Nobel Laureate*

Wajih Owais

Minister of Higher Education and Scientific Research, Amman, Jordan

Ishwar Puri

N. Waldo Harrison Professor and department Head, ESM Department, Virginia Tech, USA

Isabella Ruble

Department of Economics, American University of Beirut, Beirut, Lebanon

Pascal Saikaly

Water Desalination and Reuse Center, King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia

Abdin Salih

Director, Water Sciences Division, UNESCO, Paris, France

Imad Saoud

Department of Biology, American University of Beirut, Beirut, Lebanon

Joseph Zeaiter

Department of Mechanical Engineering, American University of Beirut, Beirut, Lebanon