Gulf Research Centre Cambridge
Knowledge for All

Workshop 1

Smart Cities in the Gulf: Current State, Opportunities, and Challenges

Workshop Directors:

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Abstract

The notion of a Smart City is one of the hottest topics in modern sustainability trends, and understandably so. Although the term "Smart City" has appeared in literature as of the late 1990s, there still is some confusion with regard to its exact meaning and context. However, and irrespective of a Smart City's precise definition, Smart City initiatives are actively being implemented in some developed cities worldwide, while their application in Gulf Cooperation Council (GCC) cities is fairly limited.

Various challenges lie ahead of GCC cities for an effective transition towards a Smart City model. The dimensions of these challenges include political, socio-economic, technological, and infrastructural aspects, with their proper integration being an essential element. With that, the purpose of this workshop is to study the current state, opportunities, and challenges related to Smart Cities in the GCC. The scope is well along

the lines of the United Nations' (UN's) Sustainable Development Goals (SDGs), in particular the 11th pillar on "Sustainable Cities and Communities".

The workshop aims to attract participants from diverse disciplines and sectors such as policy makers, engineers, political and social scientists, educators, researchers and innovators, and experts in relevant fields. The resulting exchange of knowledge is integral to bridge the gap between various stakeholders in the Smart City milieu.

Description and Rationale

Background

Cities throughout the world are facing significant challenges related to the sustainability of their various sectors such as buildings, transportation, industries, healthcare and education *[1]*. With the worldwide population growth, the sustainable management of key resources including energy, water, and food has become inevitable *[2]*. This has led to the recent concept of a Smart City, a city that creates sustainable development and high quality of life through smart and adaptive management of its resources *[3,4]*.

Cities in the GCC countries are facing increasing demand for energy, water and food with their projected population growth being among the highest worldwide *[5,6]*. A transition towards smarter GCC cities is vital to an improved management of resources, a knowledge -ased economy, and a high living standard. Such vision is in agreement with the SDGs declared in the UN resolution A/RES/70/1 of September 2015. Specifically, the 11^{th} goal titled "Sustainable Cities & Communities" is a confirmation of the need for immediate action towards more sustainable and Smart City initiatives *[7]*.

In recent years, some efforts have been taken by Gulf public and private entities to make particular sectors more efficient; i.e. "smarter" *[8]*. However, such efforts have typically been segregated among the various constituents of a city, thus failing to truly achieve the full potential of a smart and integrated city. Furthermore, there is a common misconception that a Smart City is strictly about adopting new technologies, when the main goal is how these technologies can improve people's lives *[9]*. Moreover, and with the surplus of "big" data collected from numerous sources and the Internet of Things (IoT), the challenge of a Smart City is now getting insights from data for optimal decision-making *[10]*.

Workshop Goals

The goal of this workshop is to explore the current state, opportunities, and challenges related to Smart Cities in the GCC. Scholars and decision makers will discuss current challenges and practices adopted in Gulf cities. Promising and novel implementations of Smart City concepts will be mapped and assessed.

The exchange of knowledge during the workshop will aim to bridge the current gap between different stakeholders such as policy makers, researchers and innovators, and private sector entities.

In addition, the workshop will specifically address the key elements that the GCC countries need to focus on in the next fifteen years in order to meet SDGs and thus achieve sustainable development. Moreover, it will consider the question: what are the obstacles, priorities, and policies required for an effective smart city transition?

Workshop Scope and Proposed Topics

This workshop will have four general themes (T1 to T4) to address the current state, opportunities, and challenges of Smart Cities in the Gulf. The themes are illustrated in Figure 1 and detailed below:

T1–Policy: Rules and regulations by governments or organizations, incentive schemes, education programs

T2–Smart Infrastructure: Grids and energy management, sustainable water and waste management, buildings, transportation and traffic management, communication networks

T3–Smart Technology: Information and Communications Technology (ICT), smart user apps, energy and water metering and billing, data analytics and forecasting

T4–Socio-economics: Capital and life-cycle costs, excepted benefits, citizens' responsibilities and engagement, contributions to quality of life, health, and happiness

These themes will be studied in light of the SDGs relevant to the GCC (Figure 1). How can these themes be leveraged to overcome any resistance to SDGs? What type of approach is needed to achieve these goals and transition to smarter cities in the Gulf?

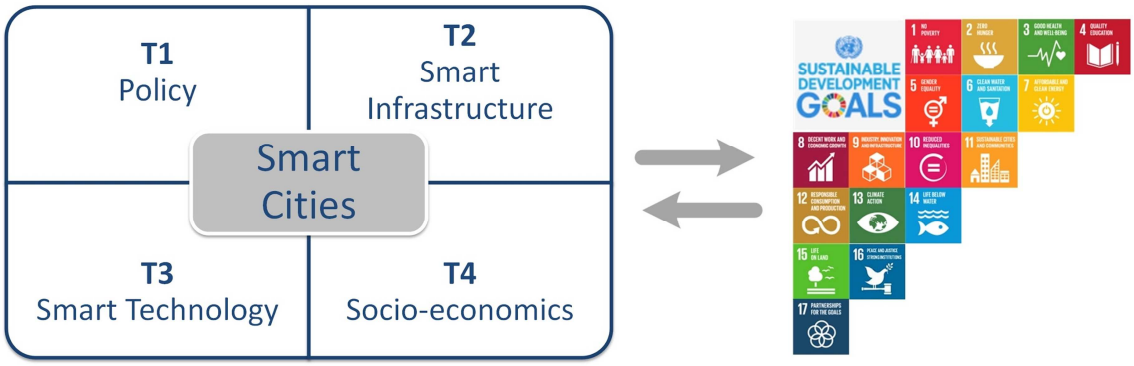

Figure 1. Workshop themes (T1 to T4) (Right side adapted from [7])

Edited Book

An additional aim of the workshop is to publish an edited book based on the individual papers presented. It is hoped that this volume will fill a gap in the relatively thin literature available on smart cities and the link to sustainability challenges in the Gulf.

Contributions to Gulf Education, Research, Development, and Innovations

This workshop will provide a venue to discuss and debate the current state, opportunities, and challenges related to Smart Cities in the GCC. A collaborative effort is needed from various stakeholders for Gulf cities to converge towards a common vision based on smart and sustainable principles. The workshop will enable and facilitate a multi-disciplinary discussion and exchange of knowledge and ideas. We hope that this will boost interest and research in the area and act as a catalyst for the provision of innovative and smarter solutions for our cities. Another contribution of this workshop will be to set a framework and engage students, government officials, and policy makers to pave the way towards a more sustainable future.

Anticipated Participants

We encourage participants from various disciplines, including but not limited to: engineering, economics, policy-making and governance, social science, and data science. Applications and case studies from the Gulf region are highly encouraged. Researchers with Gulf region experience (both native and non-native) are encouraged to apply. In addition, the workshop is also open to representatives of NGOs, private companies, governments, and think tanks. Papers are accepted from individuals, co-authors, and small group contributions depending on the topic and/or institution.

Potential topics for anticipated papers include, but are not limited to:

- Case studies of current Smart City initiatives in the Gulf
- Barriers to Smart City implementation

    - Economic
    - Infrastructure and technology
    - Political
    - Social/behavioral, etc.
- Opportunities and solutions
    - Smart grids and energy management
    - Smart metering and billing
    - Water management and wastewater treatment
    - Transportation solutions
    - ICT technologies, etc.
- Current and expected benefits
    - Decarbonizing the economy
    - Green growth and green economies in the Gulf
    - Importance of human capital and knowledge-based economies
- Agents of change towards smart cities
    - Role of public and private sectors
    - Role of innovation for sustainable solutions
    - Role of education in schools and universities
    - Role of non-governmental institutions
    - Role of academic research
- Sustainable Development Goals (SDGs)
    - Connection with Smart City concepts
    - Opportunities to capitalize on international momentum

Workshop Director Profiles

Dr. Elie Azar is an Assistant Professor of Engineering Systems and Management at Masdar Institute in Abu Dhabi, UAE. His research focuses on optimizing the performance of buildings and cities through shifts in current energy consumption patterns of people. Dr. Azar has worked as a construction engineer and building energy analyst in North America, the Middle East, and Europe. He has also authored more than 25 publications in peer reviewed journals and refereed conference proceedings including the journals ‘Energy and Buildings’, ‘Energy Policy’, ‘Computing in Civil Engineering’, and ‘Management in Engineering’. His research has been internationally recognized on several occasions, most recently in a Best Paper Award at the ASCE Workshop on Computing in Civil Engineering, as primary author. Dr. Azar received his bachelor’s degree in Mechanical Engineering from Ecole Polytechnique de Montreal, and his Master of Science and Doctorate of Philosophy in Civil and Environmental Engineering from the University of Wisconsin-Madison.

Dr. Wael Abdel Samad is an Assistant Professor of Mechanical Engineering at the Rochester Institute of Technology - Dubai Campus. He earned his BE from the American University of Beirut - Lebanon in 2007, and his MSc and Ph.D. from the University of Wisconsin-Madison in 2008 and 2013, respectively, all in Mechanical Engineering. Dr. Abdel Samad's research efforts to date have focused on investigating the state of stress of mechanical structures having unknown loading condition through hybridizing a variety of different nondestructive approaches. Most recently, and along with other colleagues at RIT, Dr. Abdel Samad successfully completed a one-year funded project for Emirates Global Aluminum (EGA) on improving the lifespan of ingot molds for a more sustainable aluminum production in EGA's cast house facility in Al Tawila, Abu Dhabi. He has authored/co-authored more than 15 publications in peer reviewed journals and refereed conference proceedings including the journals 'Experimental Mechanics', 'Engineering with Computers', and more recently 'Aerospace and Technology'.

Selected Readings

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Additional Selected Readings

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