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Knowledge for All

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Workshop No. 4

Net Zero Gulf Cities: Innovations and Sustainable Strategies

1. Directors

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2. Abstract

The Gulf Cooperation Council (GCC) countries have witnessed rapid economic growth and urbanisation over the past few decades, primarily driven by fossil fuel revenues (Mahmoud, 2022). This development has resulted in significant environmental challenges, including high energy consumption, heavy reliance on fossil fuels, increased greenhouse gas emissions, and water scarcity (IEA, 2019). The arid climate and unique economic structures of the GCC region present both obstacles and opportunities for implementing net zero strategies (Al-Saidi & Elagib, 2017).

Recognising the need for sustainable urban development, GCC nations have committed to ambitious net-zero targets focused on cities. The UAE aims for net-zero emissions by 2050, with initiatives like Masdar City serving as models for sustainable urban living (Masdar, 2020). Saudi Arabia's NEOM project exemplifies efforts to build zero-carbon cities powered entirely by renewable energy (NEOM, 2021). These projects signal a shift toward sustainability in a region traditionally reliant on hydrocarbons.

Achieving net-zero cities is crucial for environmental sustainability, energy security, economic diversification, and improving residents' quality of life (World Bank, 2020; Gouldson et al., 2015). This workshop aims to address these challenges by fostering dialogue on innovative, city-focused solutions tailored to the GCC context. By uniting experts from academia, industry, government, and civil society, we aim to advance sustainability and innovation in GCC urban environments, supporting their journey toward net zero emissions.

3. Context

Achieving net-zero cities is essential for environmental sustainability, energy security, economic diversification, and enhancing quality of life across the GCC. This workshop aims to tackle these critical goals by fostering dialogue on innovative, city-focused solutions tailored to the region's unique socio-cultural and bio-climatic needs. By bringing together experts from academia, industry, government, and civil society, the workshop seeks to drive forward sustainable urban practices and support GCC cities on their path toward net-zero emissions.

Key Themes and Topics

Climate Design of Cities and Buildings: Passive and Active Strategies

- Passive design strategies for natural cooling, shading, and ventilation
- Active systems that use renewable energy to regulate indoor climate

Life Cycle Assessment (LCA) of Buildings and Cities

- Evaluating the environmental impacts of materials, construction, and operations across the life span of buildings and urban developments
- Strategies for reducing embodied carbon and enhancing sustainability from design to demolition
- Integrating LCA in urban planning to support informed decision-making for net-zero goals

Energy Efficiency in Buildings

- Low embodied energy building designs and retrofitting existing structures
- Achieving net-zero operational energy and energy-efficient appliances and systems

Renewable Energy Integration

- Potential of solar, wind, and other renewable energy sources in urban settings
- Implementation of smart grids and energy storage solutions

Sustainable Transportation

- Development of public transportation infrastructure
- Promotion of electric and hybrid vehicles

Smart Cities and Technology

- Utilisation of IoT and AI for resource management
- Digital solutions for waste reduction and recycling

Water Conservation and Management

- Innovations in desalination and wastewater treatment
- Policies for sustainable water usage

Policy and Governance

- Incentive structures for sustainable practices
- Regional cooperation and standardisation of regulations

Community Engagement and Education

- Strategies for increasing public awareness
- Role of education in promoting sustainability.

Target Audience

- Academics and Researchers: Specialists in environmental science, urban planning, design, architecture, engineering, policy studies, and related areas who are engaged in sustainability and urban development research
- Government Officials and Policymakers: Representatives from sectors like planning, environment, energy, urban development, and transportation, focusing on sustainable policy and urban strategies
- Industry Professionals: Leaders and specialists from energy, construction, technology, and transportation sectors who drive innovation and sustainable practices in urban development
- Non-Governmental Organisations: Environmental advocates, community organizers, and sustainability-focused NGOs dedicated to fostering greener urban communities
- Students and Early-Career Professionals: Aspiring sustainability and urban development experts interested in the future of sustainable cities

4. Workshop Focus/Objectives

- Assess Current Initiatives: Critically evaluate the state of sustainability and net zero initiatives in GCC cities
- Identify Innovations: Explore and assess innovative technologies and practices that contribute to net zero emissions
- Examine Policy Frameworks: Analyse existing policies and regulations that impact sustainability efforts, identifying barriers and opportunities
- Foster Collaboration: Promote interdisciplinary collaboration among stakeholders to develop actionable solutions
- Contribute to Knowledge: Enhance the body of knowledge on sustainable urban development specific to the GCC region
- Inform Policy and Regulation Development: Provide insights and recommendations to guide policymakers in establishing supportive frameworks for net-zero goals, aligning regulations with sustainability objectives for buildings and cities

5. Paper Focus/Topics

Net-Zero Gulf Cities: Innovations and Sustainable Strategies

Renewable Energy Integration

- Deployment of solar, wind, and other renewable energy sources in urban settings
- Implementation of smart grids and advanced energy storage solutions for consistent supply

Energy Efficiency and Lifecycle in Buildings

- Comprehensive Life Cycle Assessment (LCA) of buildings and urban infrastructure to minimise environmental impact
- Green building designs that prioritize embodied and operational energy efficiency
- Retrofitting existing structures with energy-efficient materials, appliances, and systems

Climate-Adaptive and Bioclimatic Design

- Passive design strategies for natural cooling, ventilation, and shading that respect GCC's unique climate and cultural context
- Socio-culturally sensitive approaches to architecture that enhance urban liveability and community identity
- Integrating green and blue spaces to create climate-responsive, resilient urban environments

Sustainable Transportation

- Development of efficient public transportation infrastructure
- Promotion of electric and hybrid vehicles for lower emissions
- Adoption of smart mobility solutions to reduce traffic congestion and urban pollution

Smart Cities and Technology

- Utilisation of IoT, AI, and data analytics for resource-efficient city management
- Digital innovations for waste reduction, energy optimisation, and recycling
- Advanced data-driven solutions to support urban sustainability and reduce operational energy needs

Water Conservation and Management

- Innovations in desalination, greywater recycling, and wastewater treatment for sustainable water supply
- Policies promoting efficient water use across sectors
- Water-efficient technologies for both new developments and retrofitting projects

Waste Management and Circular Economy

- Strategies for waste reduction, recycling, and material recovery
- Implementation of waste-to-energy technologies to harness waste as a resource
- Integration of circular economy principles to minimise resource consumption and waste generation

Policy, Governance, and Regulatory Frameworks

- Development of incentive structures to encourage sustainable practices in urban environments
- Establishment of cohesive regulatory frameworks that support net-zero and circular economy goals
- Regional cooperation and standardisation to ensure aligned sustainability efforts across the GCC

Financing the Net-Zero Transition

- Funding mechanisms and innovative investment models for sustainable urban projects
- Public-private partnerships that drive development while aligning with net-zero objectives
- Access to climate finance and green bonds to support GCC net-zero ambitions

Community Engagement and Education

- Public awareness initiatives to foster behavioural change and support for sustainability goals
- Role of educational programs in promoting long-term commitment to net-zero practices
- Engagement of local communities to co-create and maintain sustainable urban solutions

Urban Planning and Land Use

- Integrating net-zero and sustainable goals directly into urban planning processes
- Compact city design with green spaces that promote walkability and reduce urban heat
- Mixed-use development and land-use strategies that prioritise efficient resource use

Resilience and Climate Adaptation

- Enhancing urban resilience to climate impacts through proactive adaptation measures
- Disaster risk reduction strategies that integrate climate-sensitive design and infrastructure

- Building robust infrastructure systems that can withstand extreme weather and environmental changes

Economic Diversification and Green Jobs

- Role of net-zero and sustainable cities in supporting economic diversification
- Development of green industries and job creation aligned with environmental goals
- Building local skills in green technologies and sustainable urban planning

Technology Transfer and Innovation

- Encouragement of innovation in net-zero technologies and knowledge sharing across borders
- Fostering international collaboration to bring advanced solutions to GCC cities
- Support for R&D to drive regionally relevant sustainability innovations

Health and Well-being

- Positive impact of net-zero and sustainable urban design on public health
- Designing urban environments that improve air quality, mental health, and overall well-being
- Ensuring safe and accessible public spaces that enhance quality of life

Air Quality Improvement

- Policies and technologies aimed at reducing urban pollution and improving air quality
- Initiatives to mitigate health issues associated with poor air quality in cities
- Monitoring and regulation to maintain clean, healthy air for urban populations

6. Paper Structure, Referencing, and Format

Authors should refer to the [GRM Paper Guidelines](#).

7. Publication Plans

We plan on publishing an edited volume titled “Net Zero Gulf Cities: Innovations and Sustainable Strategies.” This collection will feature selected papers from the workshop, offering an in-depth exploration of innovative strategies and solutions to address the pressing challenges of achieving net-zero emissions in Gulf urban environments. It will provide actionable insights and forward-looking frameworks to support sustainable urban development in the region. This publication is designed to be an essential resource for academics, policymakers, industry professionals, and stakeholders dedicated to advancing sustainability across the GCC region. The volume will be among the anticipated new book series Emerald Studies in Sustainable Architecture and Design: technology, society, policymaking. It will be Scopus and ISI indexed.

Papers that cannot fit in with the joint publication will be considered for publication individually in a journal or as a GRC paper, under the guidance of the workshop directors.

8. References

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9. Directors' Bio Notes

Prof. Asmaa Ibrahim serves as the Dean of the Faculty of Architecture and Design at Effat University and is currently on leave from her role as a Professor of Urban Development at Cairo University. With over 18 years in academia, she coordinates the Double Master Program in “Revitalization of Historic City Districts,” which is a collaboration between Cairo University, BTU Cottbus (Germany), and Alexandria University. Her expertise spans strategic urban planning, with 14 years at UNHABITAT, where she contributed to community development, regeneration policies, and gender-responsive planning across Egypt. Additionally, she served as an urban planning expert with Egypt’s GOPP, where she advised on national planning initiatives and developed equitable land management strategies in informal settlements and historic districts.

Prof. Ibrahim has supervised over 30 Master’s and Ph.D. theses and contributed to research publications on urban resilience, regeneration, and inclusive design. Her publications include co-editing *New Cities and Community Extensions in Egypt and the Middle East* (2018) and *Dynamics and Resilience of Informal Areas* (2016).

An esteemed researcher and educator, Prof. Ibrahim was awarded the prestigious Hubert H. Humphrey Fellowship at MIT and remains deeply committed to fostering sustainable, resilient urban environments tailored to the needs of diverse communities.

Dr.-Ing. Daniela Ottmann is a renowned expert in sustainable cities and architecture, with an accomplished career spanning academia, consultancy, and high-level advisory roles. Currently an Associate Professor of Architecture at Bond University, Australia, and a DAAD Research Ambassador, she also holds an Adjunct Associate Professorship at Griffith University’s Cities Research Institute. Her expertise, fortified by a PhD in Sustainable Urbanism and Architecture, encompasses ecologically adaptive urban design, climate-responsive architecture, and visionary socio-culturally sound city solutions. Prof. Ottmann is the author of several influential books, including *Urban Ecolution* (2015), *Urban Correlator* (2016), *Sustainable Building Materials* (2022), and *SeaCities* (2023), which further establish her as a thought leader in sustainable development. She has played a vital role in projects with UN-Habitat and in collaboration with the governments of Australia, Saudi Arabia, and Oman, bringing extensive experience in architecture consultancy, construction supervision, and policy advisory work. With notable academic and industry positions across Germany, Australia, China, Oman, and the UAE, Prof. Ottmann has been instrumental in adding research to high-impact projects like NEOM’s “The Line”, promoting human-centred,

climate-adaptive design. As PI of ‘Cooler Desert Cities’ at Zayed University’s Desert Culture Cluster in the UAE, she continues to lead pioneering research in sustainable and culturally attuned urban solutions, making her a central figure in advancing resilient, future-ready cities across the hot-arid climate regions globally.