



# Advances in Energy Research, Materials Science and Built Environment (EMBE) – 1<sup>st</sup> Edition

A Book of Abstracts



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# **Advances in Energy Research, Materials Science & Built Environment**

A Book of Abstracts submitted to the 1<sup>st</sup> edition of the international conference on **Advances in Energy Research, Materials Science & Built Environment (EMBE)** 03 – 04 Oct 2023



## **Acknowledgements**

IEREK would like to express its appreciation to all members of the staff and scientific committee for their tremendous efforts and contribution to the growth of this institution and for making the first edition of the international conference on Advances in Energy Research, Materials Science & Built Environment (EMBE). IEREK takes pride in being an institution that amasses a highly qualified and competent team who restlessly worked for months to make this conference what it is today in hopes of creating a well-rounded society. Last but not least, we cannot neglect the prominent role undertaken by our editors and reviewers who made it their duty to help this institution in spreading knowledge to the masses.

## Foreword

With technology advancing, helping humanity to discover, create and innovate, advancements in technology became a focal point for research, ignoring the rising costs and the lack of sustainable approaches. With extreme reliance on non-renewable sources of energy to power our cities and communities, we are contributing to the increase in greenhouse gases emissions and to the significant changes in our cities caused by climate change. These rising changes, forces us to discover alternative sources of renewable, efficient and affordable forms of energy, where it will promote sustainable, healthy and diverse ecosystems through enabling technologies that can offer promising solutions.

An overhaul is needed to our approach to designing cities, for a sustainable, resilient and eco-friendly future. In this abstract book, we discover the impact of more innovative approaches towards materials, that emphasize sustainable construction, smart energy, and more durable designs for our cities will be thoroughly investigated, while additionally exploring multiple disciplines where applying innovation can better help advancing with energy research, material science, and built environment.

In this abstracts book, which is an assortment of the highest quality research which was submitted to the 1st edition of the international conference on Advances in Energy Research, Materials Science & Built Environment (EMBE), from the 3rd of October, 2023 – 4th of October, 2023, we investigate research on sustainability and development, green urbanism, modern construction management practices, and material efficacy in climate change mitigation.

This abstracts book Addresses many challenges and approaches, such as climate change, green urbanism's role in resilient communities and environmental efficiency, opportunities and challenges in coastal areas, evolving architecture and rethinking cities, materials for renewable and sustainable energy, the role of advanced technologies in sustainable architecture, and studies & practical applications. It will also provide an opportunity for exploration where not only new technologies in the Architecture, Engineering, and Construction (AEC) industry are highlighted, but also a guide to practical application is made available. It offers a comprehensive approach covering fundamentals, technologies, and applications through real-world examples.

## Word from the Chairman of the Board of IEREK

In this book of abstracts, we are reminded of the urgent need to address the critical challenges facing our cities and the environment. I am deeply grateful for the opportunity to bring together some of the world's brightest minds to explore solutions that can make a meaningful difference at the 1<sup>st</sup> edition of the Advances in Energy Research, Materials Science & Built Environment (EMBE) conference. It has been an absolute honor to arrange this event, and host the brilliant minds and passionate experts who have come together to tackle some of the most pressing issues facing our world today.

When I first launched IEREK – International Experts for Research Enrichment and Knowledge Exchange – in 2013, I had ambitions of establishing an institution that pursues excellence in the field of research, and connects the world's scholars, providing them with platforms that advance their academic endeavors. To see my ambition come to life, is quite an honor indeed. Ever since its conception, IEREK has remained committed to its goal of scientific dissemination by building international relationships with prestigious universities and academic institutions around the world. Our journey has been one of great privilege, for we do not walk it alone. The contribution that we attain from our partners is invaluable to us, whether it be the book editors, publishers, hosting universities, conference chairs, keynote speakers, authors, or attendees, I would like to personally thank you for contributing to the furtherance of knowledge and research.

Like with every conference that we organize here at IEREK, we hope that everyone involved in the 1<sup>st</sup> edition of the *EMBE* conference has gleaned something valuable from the experience, and walked away with a positive and memorable experience. We hope that the conference left a good impression on the scholars, who aim to deliberate upon challenges and opportunities for the issues at hand. I am confident that the message conveyed at this conference will aid in leading the world toward becoming a more sustainable, and livable place.

A handwritten signature in black ink, appearing to read 'M. Amer', with a long horizontal line extending from the end of the signature.

**Mourad S. Amer**

Architect, BSc, DSc, MSc, PhD

IEREK CEO

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**Part I:**  
**Materials for Renewable and**  
**Sustainable Energy**

# Regeneration, Resilience and Metamorphosis of the Building Envelope: Analysis of The High-Rise and Skyscraper Types

Massimiliano Natri

*Department ABC – Architecture Built Environment and Construction Engineering, Politecnico di Milano (Italy)*

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## Abstract:

The study contemplates the resilience characteristics of buildings with vertical development in the current context, according to the processes of “self-adjustment” and as a capacity for performance “re/production”, “absorption” and “reaction” towards the “perturbative pressures” caused by the incidence of degradation phenomena, obsolescence or accidental and catastrophic events. The analysis considers the “adaptive”, “selective” and “mediation” methodologies, acquired and expressed by vertical architectures, to metabolize and “mitigate” the stresses and conditions of physical, environmental and technical-economic stress, in a combined manner with the processes of innovation (design, executive and functional) and the “eco-efficient” use of energy resources.

## Keywords:

*Resilience method and thinking processes; Regeneration of architecture; High-rise and skyscraper buildings; Advanced building envelope technologies and systems*

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## A Book of Abstracts

Unlock the potential of a sustainable tomorrow at the International Conference on Advances in Energy Research, Materials Science & Built Environment (EMBE). This virtual gathering brings together leading experts, researchers, and innovators from across the globe to explore groundbreaking advancements in energy, materials science, and the built environment. Dive deep into the latest sustainable technologies, discover eco-friendly materials, and delve into the future of smart urban planning and resilient architecture. EMBE 2023 is where collaboration meets innovation to shape a world that's not just sustainable, but thriving.

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