

Preface

This book highlights state of the art, advancements, challenges, and options in the areas of renewable energy and sustainable technologies for building environmental applications. It aims to provide insight into existing knowledge about renewable energy and sustainable technologies while demonstrating their significance to greener environmental approaches. This book contributes to significant expansions in the energy technologies' research horizons; while highlighting a paradigm shift in the research and discusses substantial improvements to renewable energy and sustainable technologies for building environmental applications.

It consists of various relevant articles from world-leading experts which are chosen exclusively to illustrate the main areas of renewable energy and sustainable technologies, arranged in 14 different chapters. Chapter 1 presents a review on the inverse problem for phase change materials and application in building envelopes. The review would serve as a useful reference for the readers who are particularly interested in studying building envelopes thermal performance design. Chapter 2 provides an overview of different types of natural polymer composite membranes and their potentials in water remediation. In Chapter 3, discusses types of polymers that can be used in the development of heat exchangers for energy recovery applications in buildings. These polymeric heat exchangers are predicted to be built upon four bases; new polymers, new reinforcement or additives, new design, and new fabrication techniques. Chapter 4 highlights the potential and limitations of the solar-induced ventilation strategy in the tropical region, particularly in its subtypes of tropical rainforest climate and tropical monsoon climate. The chapter is based on the scientific results from the previous studies, recent innovations and latest technologies associated with such ventilation strategies and several significant examples of its applications in the contemporary tropical buildings. Lighting technologies and the impact of lighting design are covered in Chapter 5. This chapter also discusses user behavior to the energy consumption of lighting and life cycle assessment of luminaires. With the aim to have an in-depth understanding of energy recovery technology for building applications, Chapter 6 presents the mechanism and the application of this technology in various climatic conditions such as winter and

summer conditions; cold and extremely cold climate conditions; and hot-humid condition based on previous data in the open literature. This chapter also examines the limitations, research gaps, and future recommendations pertaining to this technological development. Chapter 7 includes a discussion on critical design concepts of toplighting systems based on natural light for building interiors in different geographical locations. This chapter also covers issues on daylight in passive and sustainable architecture.

Understanding nature and biodiversity as part of sustainable agents will be advantageous to the environment and ecosystem. With this aim, Chapter 8 addresses polychaetes as biological agents of sustainable technology for environmental applications. This chapter focuses on the distribution of polychaetes in the world, and explains its role in tackling environmental issues. Examples include, detoxifying inorganic contaminants into less toxic compounds, processing organically enriched sediments via their digestive system and overcoming hypoxia and anoxia cases plus sulphidic condition are highlighted. Chapter 9 explores the role of incorporating plants in green building designs as one of the approaches to reduce energy consumption in buildings and to mitigate global warming. The nature of plants, their characteristics, and localized setting to benefit the microclimate are discussed. A discussion on low-carbon technology concept and characteristics of turbine ventilator as eco-friendly technology is presented in Chapter 10. The mechanism and concept are discussed by taking into account conventional and hybrid designs of turbine ventilators. Due to environmental concern, research and engineering interest have been changed from using synthetic adhesive to a new biobased adhesive or self-bonding board that is free from synthetic adhesive called binderless board. With this regard, Chapter 11 presents a review on binderless board manufacturing, treatment, and other processes using oil palm biomass as raw materials. The scope of this chapter is only based on the environmental aspects without coinciding with any economic factors or costing. Chapter 12 gives an overview of the lifecycle approach in materials selection and the assessment of materials used in construction based on ISO 14040:2006 and ISO 14044:2006. Analysis of life cycle assessment on building materials adopted in mosque construction in Iraq is also presented. Chapter 13 provides a review on the prospects of algae for biofuel production. Macroalgae integration into a biorefinery is also discussed. This chapter concludes that further research must be intensified to identify novel and the most appropriate algae species with high oil contents and fast-growth rates in a specific environment in the future. Chapter 14 presents a detailed review on energy production by microorganisms such as bacterium and algae. Sustainability of energy recovery by biological process is also highlighted at the end of this chapter. This information should be useful background for the understanding of energy production comparing competing options for biological and environmental applications.

Last but not least, we would like to take this opportunity to convey our appreciation to all contributors of the articles in this book. Special thanks entrusted to all reviewers that have provided comments and recommendations to the articles contained in this book. Our special thanks to Ms. Tiffany Gasbarrini, Mr. Brian

Halm, and Ms. Zoe Kennedy from Springer US for their kind support and great efforts in bringing the book to fruition. For the Editorial Team of Springer, we express our thanks for their contribution in making this book publishable. It has been a pleasure working with the team in the publication process of this book. We hope that this book can be a valuable reference for senior undergraduate and graduate students, engineers, architects, practitioners, scientists, researchers, planners, and employees in the area of renewable energy and sustainable technologies.

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