

Preface

In an era marked by unprecedented environmental challenges and resource constraints, the concept of a circular economy (CE) has emerged as a pivotal framework for fostering sustainability and resilience across industries. *Applied Circular Economy Engineering* delves deeply into the multifaceted dimensions of CE, offering readers an academically rigorous yet practically grounded exploration of its principles, methodologies, and applications. This multidisciplinary endeavor seeks to illuminate the challenges and opportunities associated with CE implementation across key industries and domains.

The chapters within are organized into six comprehensive parts, each focusing on a crucial aspect of CE engineering and management:

- *Part 1* sets the stage with an introduction to CE, highlighting its challenges and proposing pathways for integrating CE principles into business and engineering practices. This section serves as a gateway to the diverse and rich discussions presented throughout the book.
- *Part 2* delves into the critical role of materials in CE. From the complexities of recycling aluminum alloys to the potential of polymer circularity, these chapters examine innovative approaches and technological advancements required to overcome barriers to material reuse and recycling. The insights offered are both practical and forward-looking, addressing current challenges while envisioning a sustainable future.
- *Part 3* shifts the focus to products, emphasizing design and servitization. Discussions range from the implementation of circular processes in industrial sectors like electric drives to the integration of circularity in healthcare and product design. These chapters underscore the importance of embedding circular principles during product development, offering case studies and methodologies that bridge theory and practice.
- *Part 4* explores the technological foundations essential for enabling CE processes. From advanced sorting technologies for polymers to digital innovations that optimize material flows, this section illustrates how emerging technologies can drive systemic change and facilitate the realization of CE goals.
- *Part 5* focuses on management and organizational strategies, addressing the implementation of circular business models, and resource efficiency management in small and medium-sized enterprises (SMEs). By combining

theoretical frameworks with practical applications, these chapters provide valuable insights into the integration of sustainability-oriented innovations within organizational structures.

- *Part 6* first contextualizes the cultural dimensions of CE engineering, followed by an exploration of the broader implications and limitations of CE. Adopting a critical lens, it examines the thermodynamic boundaries of circularity and the need for comprehensive indicators to assess its alignment with overarching sustainability objectives.

This book represents the culmination of contributions from experts across academia and industry, each bringing a unique perspective to the challenges and opportunities inherent in CE engineering and management. It is intended to serve as both a scholarly reference and a practical guide for professionals, researchers, and policymakers committed to advancing sustainable development through innovative circular practices. By bridging the gap between academia and industry, this book provides valuable insights for engineers, managers, policymakers, and researchers dedicated to fostering sustainability.

We extend our deepest gratitude to the contributors, whose expertise and perspectives have greatly enriched this work. We hope this book inspires innovation, fosters collaboration, and contributes to the realization of a more sustainable and circular future.

The Editors

About the Companion Website

This book is accompanied by a companion website.



<https://www.wiley.com/go/circulareconomyengineering>

This website includes:

- Circularity Indicator Toolkit

