Foreword

We live in a plastic world … and plastic circularity has become a local, national and global emergency together with the initiatives for climate neutral. This is the motto that guided our creative and synergistic energies in the development of this book.

In the current context of a very high level of production, but also of the consumption of plastics (in various forms) we are aware that the multifunctionality of plastics means that they will continue to be omnipresent in our lives and in the environment in which we live (air, water, soil). In this context, the need to act in accordance with the circular economy and to mitigate their climate (and environmental) impact is imposed, by educating and raising awareness of responsible consumption (reducing and eliminating the unsustainable consumption that we have created). Our perception, as users and consumers, of plastics has changed in recent years, leading to an exaggerated, chaotic consumption that has become a threat given the effects of plastic pollution and toxicity. All these chain phenomena have forced us to carefully rethink the way we use plastics … but we still have a lot to learn and do because air, water and soil pollution have reached worrying levels, and the effects on life are already proven by medical research.

However, we believe that we must address not only individual consumption behaviour and behavioural patterns, but more urgently the underlying norms and power relations that support and maintain unsustainable levels of plastic consumption. Specialized literature and the real economy have proven that cheap raw materials and abundant fossil fuels have contributed to stimulating our plastic consumption patterns. Thus, to eliminate the carbon footprint of plastics, an important consideration is to make plastic more valuable both in people's minds and throughout the value chain … and *this can only be achieved through education!*

The variety of shapes and structures of plastics is significant, and their widespread use in many areas generates diverse legislative and regulatory provisions, for example in the field of climate, environment, various industries such as automotive, construction, textiles, chemicals, trade and waste management. We are thus witnessing a frag-

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mentation of the legislative framework and uncoordinated measures around the production, use and recycling of plastics. However, two policy trends have emerged: market restrictions for single-use plastics and the transition to a circular plastics economy. The first is evident in the growing number of policies aimed at reducing plastic pollution by banning certain items, such as plastic bags or straws. The second can address several challenges related to plastics, such as resource inefficiency, as well as environmental and climate impacts. Furthermore, the circular economy is shaping plastics policies, particularly through EU105 and Chinese106 provisions and among non-state actors.

The current sustainability issues, highlighted by the contemporary plastic crisis that is set to intensify in the coming years, are priorities for a growing number of actors and initiatives; however, the ambitions and objectives of these initiatives and strategies fail to mitigate the negative impact of plastics on the climate, as they tend to focus on mitigating plastic pollution.

The plastics value chain is much more complex compared to other energy- and emission-intensive material industries. This is due to the large variety of interconnected processes and companies in petrochemical clusters, as well as the great diversity of plastics and the ubiquity of short- and long-life products in all areas of the economy. In conclusion, the dependence on fossil fuels is extremely strong. This complexity of the value chain, including uncertainty regarding the effectiveness of measures and conflicts of interest between value chain actors, constitute barriers that hinder the vision of a zero-emission future, but also the path to follow towards this goal. Furthermore, the accelerating environmental challenges of our time, particularly those related to plastic production, consumption, and waste, demand not only technological innovation but also a profound transformation in how we think, learn, and act. This book, *The Digital Frontier of Circularity,* emerges as a timely and necessary contribution to this global discourse. We consider it as a valuable starter kit for higher education institutions teaching staff.

Developed within the framework of the EDU4 PlastiCircular project, this book reflects a collective effort to bridge the gap between scientific knowledge, educational practice, and societal needs. It recognizes that the transition from a linear to a circular economy is not merely a technical shift, but a deeply educational one, requiring new competencies, interdisciplinary thinking, and a redefinition of human-environment

relationships. What makes this book particularly valuable is its integrative perspective. It does not treat plastic waste as an isolated environmental issue, but situates it within broader systems of production, consumption, policy, and education. By combining insights from research, pedagogy, and real-world initiatives, the editors and contributors offer a comprehensive resource that speaks to educators, researchers, policymakers, and practitioners alike. A central strength of this work lies in its emphasis on education as a catalyst for change. The chapters highlight *innovative pedagogical approaches,* from experiential learning and citizen science to digital platforms and gamification, that empower learners to actively engage with complex sustainability challenges. In doing so, the book moves beyond awareness-raising to foster critical thinking, practical skills, and behavioural transformation.

Equally important is the book's *focus on digitalization as an enabler of circularity.* In an increasingly interconnected world, digital tools and platforms provide unprecedented opportunities to scale knowledge, facilitate collaboration, and support lifelong learning. The EDU4PlastiCircular initiative demonstrates how digital environments, open educational resources, and international partnerships can enhance accessibility and impact across diverse educational contexts.

The international and collaborative nature of this project further enriches the book's contribution. Drawing on experiences from multiple European countries and institutions, it reflects a shared commitment to addressing plastic pollution through education and innovation. This cross-border perspective underscores the global nature of the problem and the need for coordinated inclusive solutions.

Importantly, this book does not shy away from acknowledging the challenges ahead. Institutional barriers, resource constraints, and knowledge gaps remain significant obstacles to integrating circular economy principles into education systems. Yet, by identifying these challenges and offering evidence-based recommendations, the authors provide a clear pathway forward. In essence, this volume serves as both a guide and an inspiration. It equips higher education institutions and educators with practical tools and conceptual frameworks, while also inviting readers to rethink their role in shaping a more sustainable and circular future. As we stand at a critical juncture for our planet, works like this remind us that education is not only about transmitting knowledge, but also about enabling transformation. *The journey toward a circular and climate-neutral economy begins in classrooms, laborato-*

ries, communities, and digital spaces. This book is a meaningful step in that journey!

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