

Circular Economy and Sustainability

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This book series aims at exploring the rising field of Circular Economy (CE) which is rapidly gaining interest and merit from scholars, decision makers and practitioners as the global economic model to decouple economic growth and development from the consumption of finite natural resources. This field suggests that global sustainability can be achieved by adopting a set of CE principles and strategies such as design out waste, systems thinking, adoption of nature-based approaches, shift to renewable energy and materials, reclaim, retain, and restore the health of ecosystems, return recovered biological resources to the biosphere, remanufacture products or components, among others.

However, the increasing complexity of sustainability challenges has made traditional engineering, business models, economics and existing social approaches unable to successfully adopt such principles and strategies. In fact, the CE field is often viewed as a simple evolution of the concept of sustainability or as a revisiting of an old discussion on recycling and reuse of waste materials. However, a modern perception of CE at different levels (micro, meso, and macro) indicates that CE is rather a systemic tool to achieve sustainability and a new eco-effective approach of returning and maintaining waste in the production processes by closing the loop of materials. In this frame, CE and sustainability can be seen as a multidimensional concept based on a variety of scientific disciplines (e.g., engineering, economics, environmental sciences, social sciences). Nevertheless, the interconnections and synergies among the scientific disciplines have been rarely investigated in depth.

One significant goal of the book series is to study and highlight the growing theoretical links of CE and sustainability at different scales and levels, to investigate the synergies between the two concepts and to analyze and present its realization through strategies, policies, business models, entrepreneurship, financial instruments and technologies. Thus, the book series provides a new platform for CE and sustainability research and case studies and relevant scientific discussion towards new system-wide solutions.

Specific topics that fall within the scope of the series include, but are not limited to, studies that investigate the systemic, integrated approach of CE and sustainability across different levels and its expression and realization in different disciplines and fields such as business models, economics, consumer services and behaviour, the Internet of Things, product design, sustainable consumption & production, bio-economy, environmental accounting, industrial ecology, industrial symbiosis, resource recovery, ecosystem services, circular water economy, circular cities, nature-based solutions, waste management, renewable energy, circular materials, life cycle assessment, strong sustainability, and environmental education, among others.


Giovanni Lagioia • Annarita Paiano
Vera Amicarelli • Teodoro Gallucci • Carlo Ingraio
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Innovation, Quality and Sustainability for a Resilient Circular Economy


The Role of Commodity Science, Volume 2


 Springer


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Foreword

The weaknesses of the current economic, social, and environmental scenario, together with the impact of the COVID-19 pandemic that the humankind has faced, are increasingly stimulating an in-depth reflection on the organizational models that today's society is based upon. Those are mainly related to consumers' behaviours and to the productive models of businesses and organizations, as well as to the functioning of national and supranational socio-political systems.

Therefore, in the process of restoring stability, it is desirable that any form of circular economy (CE) system derive from the implementation of the relevant issues of sustainability, innovation, and quality, not only on the scale of production but, also, on that of use/consumption and disposal. Here comes the life cycle thinking (LCT) perspective that is based upon designing not just products but also products' life cycles that comply with the goals and targets of sustainable development. Doing so will make it possible to satisfy CE principles and loops, and so extend products' life cycles, and close resource loops through recycling processes. This is a huge challenge that should follow an approach based on exchanging and sharing knowledge, thereby going beyond the multidisciplinary and transversal approach that has always been a classic in Commodity Science. The latter is aimed at collecting the homogeneous and unitary body of research fields that revolve around the production of material, food, and energy commodities. This includes the study, analysis, and evaluation of both resources and technologies used for their extraction and transformation. It is also expanded to the assessment of the consequent implications on the total quality and use value of the goods and on the external environment with which they interact, including the environmental management and certification systems.

Commodity science can play multiple relevant roles in this regard, as it is highly attached to innovation, eco-design, quality, circular economy, industrial ecology, and sustainability. All of those relevant issues and related complex problems involve a holistic system approach, regulatory aspects, and empirical knowledge and demand the active participation of all stakeholders involved in the commodity's life cycle, including designers, technicians, practitioners, producers, company managers, and retailers. Therefore, it is recommended that the making of public decisions

for promotion of aforementioned issues is supported and informed by scientifically sound quantitative information so as to discern values from facts and to help a fair attribution of responsibility along the entire supply chain and life cycle. Under this perspective, the XXX National Congress of Commodity Science can play multiple key roles, as it created a valuable platform to share and build upon knowledge and skills in a way to strengthen the already existing links among the key actors of the world of academia and research, industry, and politics discussion and study.

President of AISME (Italian Scientific
Association of Commodity Science),
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Alessandro Ruggieri

Preface

The XXX National Congress of Commodity Science was held in Bari (Italy) on 27 and 28 October 2022; it was promoted by the Italian Academy of Commodity Science (AISME) and was hosted by the Department of Economics, Management and Business Law of University of Bari Aldo Moro. Its aim was to explore the relevant quality, innovation, circularity, and sustainability issues, in an integrated and multidisciplinary approach.

The Congress collected a total of 113 contributions, which can be considered as the sign of the relevance and importance of the research themes it was conceived to address.

The Congress hosted an opening session for institutional greetings, followed by a keynote speech on sustainable innovative energy production systems and an oral section conceived to an overview of the key findings from poster-presented research. In particular, the contributions received were assigned 21 oral presentations and 92 posters. The Congress was then structured into three plenary sections (each per thematic area), chaired by spokes-professors of the Academy, to host the aforementioned oral presentations. The latter were selected in a way to:

- Make sure that the Congress could provide sector operators with methodological tools enabling understanding of the current evolutionary dynamics, particularly in innovations and quality analysis and management
- Contribute to developing new growth models and paradigms towards paths for sustainable development strategies on the micro- and macro-dimension scale in the medium-term time horizon

This year's edition of the Congress was the 31st, with the first held in the early 1960s in Bari^{1#1}, which contributes to making it an event of undoubted historical significance. In Appendix 1, the reader will find all the Congress events that have

^{1#1} “Convegno sul tema: Progresso tecnologico e miglioramento della qualità”, Bari, 12-13 settembre 1962. Atti in: Quaderni di Merceologia (Bari), 1, 1, Bari, Editore Cressati.

been organised since then. In all of this, it must be said that the commodity science school of Bari is undoubtedly one of the oldest and most prestigious in Italy; it all dates back to the School of Advanced Studies of Commerce that, when founded in 1886, was the fourth in Europe. Over the course of its history spanning more than 130 years, the school has contributed to advancing research both at the national and international level. This has been documented by a historical library with volumes dating back to the second half of the 1800s and a commodity science museum that contains vintage equipment and materials that were used and tested for original research development.

The Congress represented a platform for the exchange of knowledge and skills in all those research development fields which commodity science has always interfaced with, giving its important contributions, including material science, energy, agriculture, engineering, business management, quality management, innovations, and social equity. To that end, researchers, practitioners, managers, producers, and other stakeholders were positively involved in the Congress. In particular, the Congress managed to trigger a constructive dialogue with the territory and with economic, industrial, and political stakeholders on environmental, economic, and social issues related to natural resource exploitation and environmental pollution. In doing so, particular attention was paid to the aspects of innovation, quality, and sustainability that were assessed by Congress participants, with a holistic system perspective, through application of internationally recognised scientifically based methodologies capable of implementing sustainable aims and improving the economic-environmental performances of economic activities, including material flow analysis, life cycle assessment (LCA), and the multi-indicator environmental footprint accounting. This will contribute to the upswing and resilience of companies and societies, despite the undeniable difficulties deriving from the pandemic, the current geopolitical upheavals, and the consequent international economic crisis.

An adequate and timely transition towards a green economy could represent an important opportunity for local territories to improve their levels of quality, sustainability, and competitiveness in the medium and long term. This puts emphasis on the need for economic operators to comply with the obligations required by the reference legislation in the context of transitioning to sustainable circular forms of the economy; doing so will allow them to assess the possible future implications on their business activities. This can be relevant and useful for all public and private organisations operating in various economic sectors. Furthermore, dissemination of results from the Congress can represent an important knowledge-enhancement opportunity for all those entrepreneurs and producers who intend to undertake initiatives with reduced environmental and socioeconomic impact.

In the light of this, economic operators (i.e., managers, entrepreneurship, business associations, public decision-makers) and students were invited to take active part in the Congress for a profitable and mutual exchange of information on the Congress research themes. Furthermore, several business companies have supported this event; their names have been highlighted in a dedicated section in the continuation of the book.

In this context, it is worth highlighting that the Congress objectives and targets fully reflect the purpose recognised by the AISME founders of advancing and promoting commodity science development in the field of scientific and applied research and enhancing the knowledge of the whole commodity science subject and related key features, especially in the sector of public institutions. In doing so, the contributions of commodity scientists will be made increasingly available to producers and consumers as well as to the society as a whole. This can play an essential role in the implementation of technological innovation solutions for creation of production and consumption models that are urgently needed to move towards a society that respects the principles and objectives of sustainable development.

Thanks to the remarkable number of contributions and the numerous opportunities created for debating and sharing ideas, the Congress managed to address key environmental and socioeconomic issues. These can encourage good practices for implementation of circular economy models to best combine profitability with sustainable environmental management and quality of commodities.

The 113 conference papers went through a double-blind review and were put together to form this book titled *Innovation, Quality and Sustainability for a Resilient Circular Economy: The Role of Commodity Science* that is published by Springer Nature as part of the Circular Economy and Sustainability series. Considering the number of papers included and the resulting length of the book, the latter was split into volume 1 and volume 2, both comprising papers dealing with the most relevant and up-to-date issues of innovation, quality, and sustainability in a wide range of sectors.

Under this perspective, Volume 1 explores the sectors of agriculture, biomass, foods and beverages, consumers' awareness and behaviours, digitalisation, and tourism.

Volume 2, instead, investigates the waste management sector and several others related to energy, materials, and transports. In addition to this, Volume 2 reviews and builds upon the general important aspects of quality, circular economy, and sustainability.

Though it came to a national congress, there has been papers being contributed by authors' teams coming from European countries like Poland and Spain. Such puts emphasis upon the attention and interest that research themes like those addressed by the Congress spark on the international level. Furthermore, scanning through the 113 papers, the book editors could see that research development was often taken as the occasion to strengthen ongoing collaborations both at the national and international level and create new ones.

The collected papers explored the three themes the Congress was centred upon in a multitude of sectors. In this regard, from Fig. 1 there is evidence that "Agriculture, biomass, foods and beverages" was the most investigated one with a total of 37 papers, followed by waste management and a miscellaneous of general facts, with 14 papers each either way, whereas, as evident from Fig. 2, the majority of the conference papers (61%) investigated circular economy and sustainability-related issues.

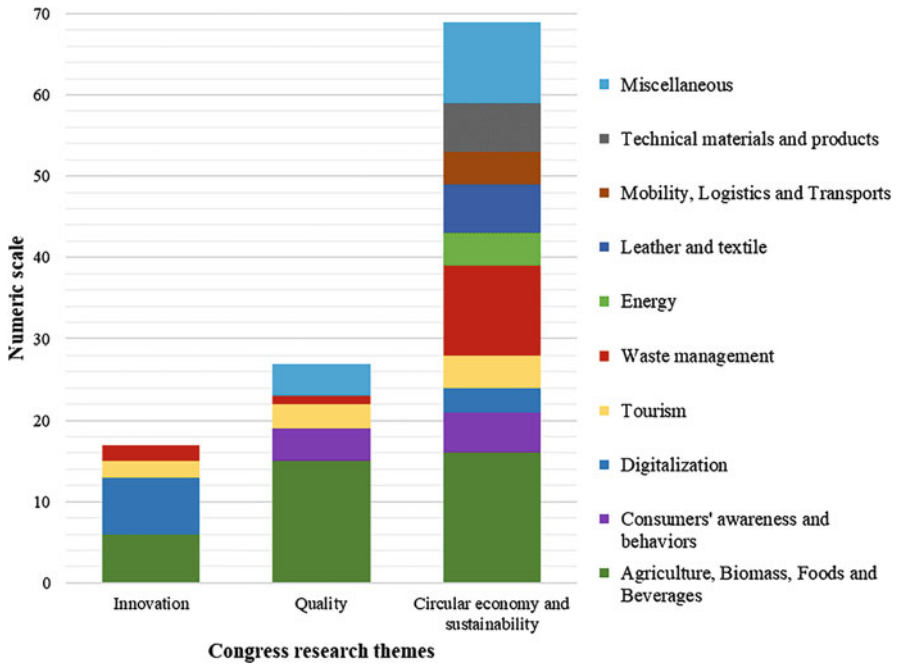


Fig. 1 Number of conference papers per thematic research area and investigated sector

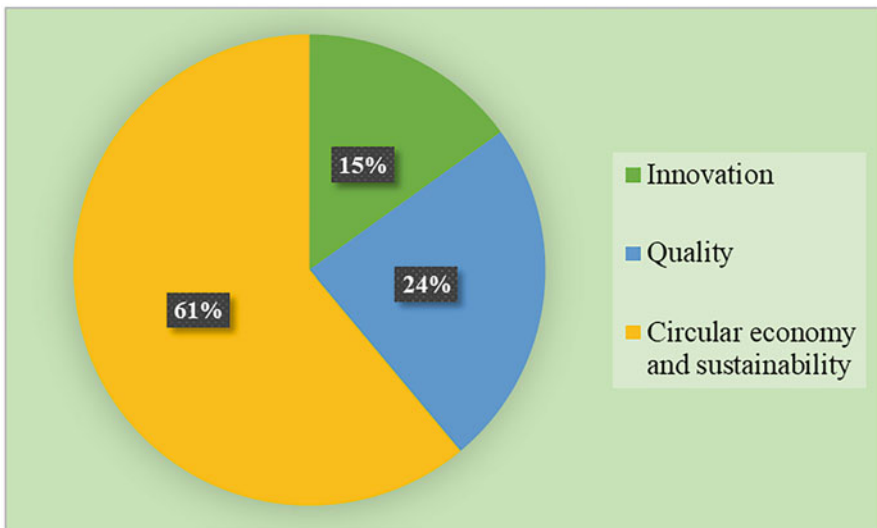


Fig. 2 Percentage distribution of the collected conference papers based upon the thematic area they have addressed

Based upon the number and quality of the contributions, it can be asserted that the Congress attained its main objectives of updating, advancing, and promoting interdisciplinary research on innovation, quality, circular economy, and sustainability.

The 113-paper collection is expected to make it possible for the Congress to advance knowledge on the subjects of quality of commodities and of ecological transition, with particular attention to the innovations and to the environmental and socioeconomic implications on the production, use, and consumption of material and energy commodities that are currently available on the market.

Finally, findings contained in this volume will contribute to guiding public and private decision-makers in the identification process of the most appropriate methods and timing in the processes of innovation for commodities' quality enhancement and of transition to a sustainable equitable efficient economy and providing economic operators with in-depth knowledge to deal more effectively and efficiently with the related implications and opportunities.

Bari, Italy

Giovanni Lagioia
Annarita Paiano
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We would like to deeply thank the sponsors for their support to the Congress. It was a real fortune for us to be able to bank upon your generous donors, which contributed to making the Congress possible.

Thanks for supporting us to create a platform for the exchange of knowledge on the relevant issues of innovation, quality, and sustainability, and on the measures to take to accelerate the transition to a sustainable, equitable, circular, post-fossil carbon society.

The Congress was just the beginning of a new joint collaboration journey, as we would be honoured to have the opportunity to work closely with your business in the future!

With gratitude
The Editors



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