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DOTTORATO DI RICERCA

INCICLO: XXXVI

TITOLO DELLA TESI: **From Circular Economy to Circular Society: The importance of including grassroots innovations in the mainstream agenda**

TESI PRESENTATA DA: Simone Gibellato

TUTOR: Marco Pironti

COORDINATORE DEL DOTTORATO: Francesco Quatraro

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Declaration

This is to certify that the thesis is my original work, and it has not been submitted for another academic award. The academic work contained therein was produced by me and accurate citations were made where necessary.

Statement of Copyright

Acknowledgments

I want to express my gratitude to several people who have been incredibly supportive during my research journey.

First, I want to thank Professor Marco Pironti, my supervisor. He not only gave me the freedom to explore my research topics but also provided essential guidance. As the head of our research group, his insights have been precious across the various subjects I' have explored. Collaborating with him has been a privilege.

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Lastly, I want to acknowledge my Ph.D. classmates. Interacting with them exposed me to diverse ideologies and research topics beyond the scope of my thesis, which significantly enhanced my critical thinking skills.

For my parents

The second law that entropy always increases, holds, I think, the supreme position among the laws of Nature. … if your theory is found to be against the second law of thermodynamics I can give you no hope; there is nothing for it but to collapse in deepest humiliation.
- SIR ARTHUR STANLEY EDDINGTON

We cannot seek achievement for ourselves and forget about progress and prosperity for our community... Our ambitions must be broad enough to include the aspirations and needs of others, for their sake and our own.
- CESAR CHAVES
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Abstract

Structure

Abstract

This Ph.D. thesis investigates the transformative potential of grassroots innovations in fostering a Circular Society, emphasizing their impact on socio-technical systems. Through a comprehensive analysis, the thesis explores disruptive sustainable innovations across cities, ecosystems, and key sectors (food, energy, waste, clothes, and technology). The research integrates grassroots initiatives into the sustainable innovations literature, highlighting their role in achieving institutional, social, and environmental sustainability.

This thesis covers different main topics.

Analysis of Grassroots Innovations: This thesis Examines various grassroots innovations and their potential to reshape socio-technical systems.

Central Role of Energy Transition: This thesis Emphasizes the role of active citizenship in the food, energy, and waste sectors' long-term sustainability to improve natural resource management.

Role of artificial intelligence and blockchain: this thesis explores how the democratization of innovation through the use of enabling technologies such as artificial intelligence and blockchain simplifies the management of natural resources and promotes new organizational and innovative forms

Theoretical Analysis of Key Sectors: Investigating key sectors (food, energy, waste management) this thesis shows the transformative potential of grassroots innovations for local production and consumption.

From the theoretical point of view, This thesis brings different domains of grassroots innovations, sustainability, ecological economics, and critical management. Indeed, this thesis advocates for new organizational forms, promoting alternative consumption models aligned with social well-being and environmental protection.

From a managerial standpoint, the research encourages multi-stakeholder governance to enhance natural resource management and social cohesion. Policy implications highlight the need for creating socio-technical niches for grassroots innovations and institutional support to promote the Circular Society concept.

Structure

This thesis adopts a seven-chapter structure. By focusing on the discourse of grassroots innovation in the domain of Circular Society this thesis is divided into seven chapters prefaced by this section w

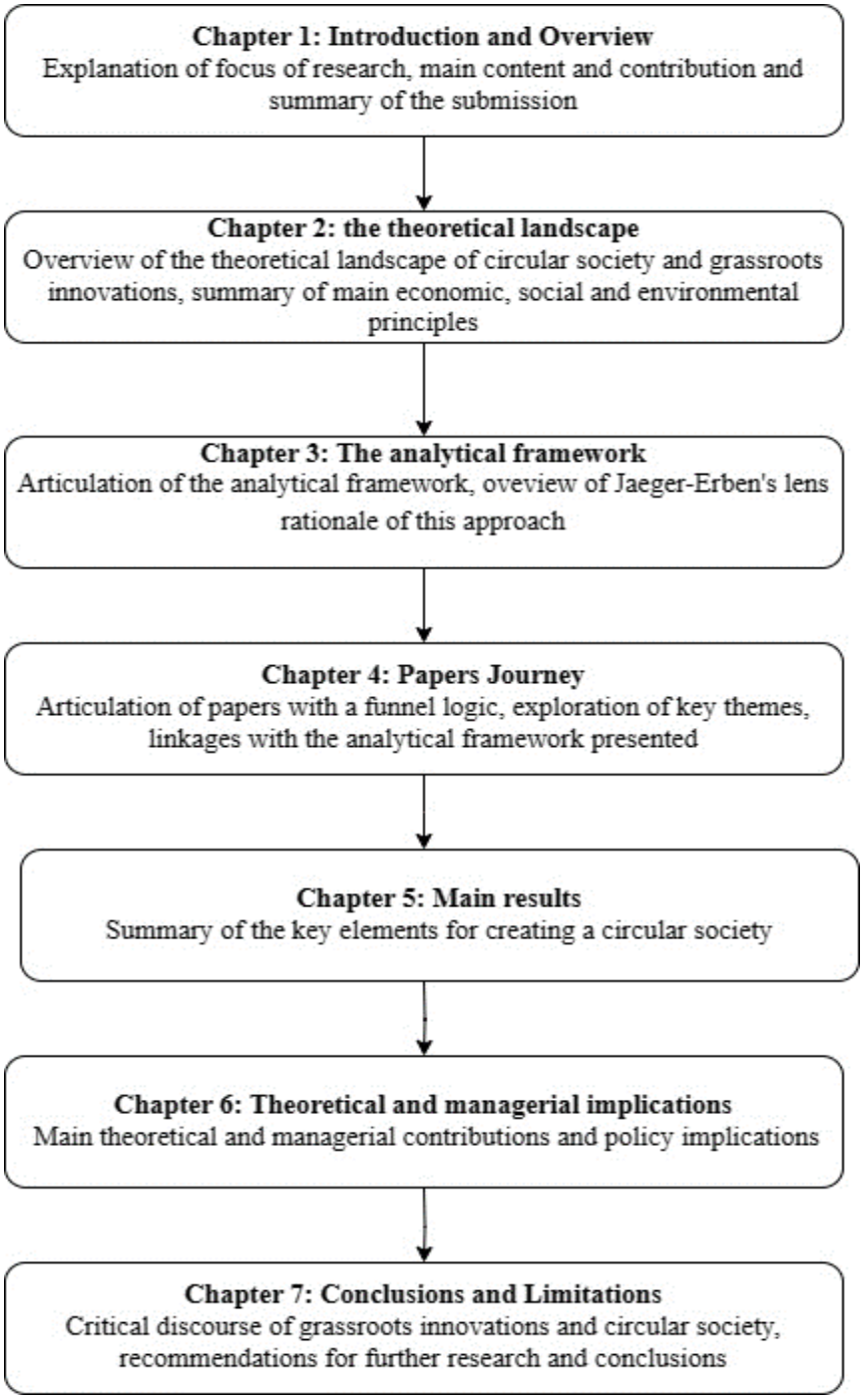

Figure 1: Thesis structure

More specifically, this thesis is divided into the following seven chapters:

Chapter 1 provides an introduction and an overview of the journey of this thesis. In this chapter, I will explain the rationale and the methodological approaches. A summary of the paper is provided, and the wider contribution of the collection of papers is presented.

Chapter 2 provides an overview of the theoretical landscape of grassroots innovations and a summary of the key concept of Circular Society, ecological economics and sustainable innovation paradigms that supports this research.

Chapter 3 outlines the analytical framework that is central to this thesis. It provides an overview of Jaeger-Erben's work relating to Circular Society, showing what are the main characteristics of this social model.

Chapter 4 articulates the research journey through each of the 10 papers. The key themes addressed are identified following a funnel logic (cities, ecosystems, and specific projects), and the links to key sustainable innovations and the Jaeger-Erben theory are explained.

Chapter 5 presents a comprehensive and critical analysis of the main sectors, innovations, and technologies crucial to realize a Circular Society.

First, this thesis emphasizes the significance of grassroots innovations as a means for realizing the Circular Society.

Second, this collection of papers shows the central role of the energy transition in promoting a novel consumption paradigm.

Third, this thesis shows the role of artificial intelligence, focusing on the blockchain, as enabling forces that encourage the adoption of more inclusive consumption models.

Lastly, this collection of papers identifies key sectors that necessitate the inclusion of new stakeholders to promote consumption processes that are both equitable and sustainable, aligned with the principles of the Circular Society.

Chapter 6 presents in detail the main contributions of this thesis. Considering that grassroots innovations require insights both from a theoretical and managerial point of view (considering the socio-technical and legislative limits), this chapter shows in detail theoretical, managerial, and political implications to favor the creation of grassroot processes in line with the principles of the Circular Society.

Chapter 7 presents the main limitations, and future lines of research needed to spread this social model in different social context.

Introduction and overview

Chapter One

1.1 Introduction

By describing the thesis's research journey, this chapter places the project in its proper historical context. The methodological approaches are described, and the justification for the decisions is given. The different publications are summarized, and the work's overall contribution to the fields of Circular Society and grassroots innovations is given.

1.2 General background

In recent years, the circular economy (CE) is becoming increasingly important both within the small-medium enterprise (Rizos et.al., 2016) than in the political agenda (Hobson & Lynch, 2016; Fratini et.al., 2019).

Indeed, the circular economy, championed by the Ellen MacArthur Foundation, initially appealed to big corporations for resource efficiency, cost savings, and improved brand reputation (Tonelli & Cristoni, 2018). Afterwards, the circular economy has evolved beyond waste reduction to encompass broader sustainability concepts, including social equity (Padilla-Rivera et al., 2020). It promotes continual resource use and has become a holistic approach, addressing environmental, social, and economic dimensions (Murray et al., 2017). Its expansion signifies a shift towards more sustainable and resilient business and governance models (Hofmann, 2019). For this reason, governments later embraced it for environmental conservation and job creation through regulations and policies (Hartley et al., 2020). Small enterprises joined the movement, seeing innovation opportunities and a competitive edge (Rizos et.al., 2016).

Nevertheless, 46% of the 114 definitions of CE collected by Kirchherr et.al. (2017) focus only on the economic prosperity in the business sector. Furthermore, while comparing the Circular Economy to sustainable development research, Geissdoerfer et al. (2017) concluded that the Circular Economy only emphasizes the economic prosperity rather than using a triple bottom line approach.

Indeed, CE has several limits in terms of sustainable development, such as:

Environmental limits: The thermodynamic Law, Spatial and temporal problems, The rebound effect, Path dependencies, Problems in inter-organizational strategies, definition of physical flows (Korhonen et.al., 2018).

Socio / economic limits: Schroeder, et al. (2019) have shown that CE practices have not remarkable links with most of the 17 sustainable development dedicated to the social sphere: SDG 3 (Good Health and Well-being), SDG 5 (Gender Equality), SDG 10 (Reduced inequalities), SDG 11 (Sustainable Cities and Communities), and SDG 16 (Peace, Justice and Strong Institutions) or just an indirect effects on DG 1 (No Poverty) and SDG 2 (Zero Hunger).

In support of this Genovese and Pansera (2020) show how most CE studies use a technocratic and apolitical approach leaving out the social implications, while Hobson and Lynch (2016) argue that CE has presented a curtailed and impoverished view of the role of citizens. For this reason, it is important to analyze other kinds of economic and social models such as that of the model of the Circular Society (Jaeger-Erben et al., 2020).

These limitations on the Circular economy (CE) concepts, particularly its emphasis on economic prosperity over a triple-bottom-line approach, can have several consequences for research, policy-making, and practical applications.

These are the main implications.

Limited holistic focus: The circular Economy's emphasis on economic prosperity may lead to a limited focus on environmental and social sustainability aspects. This can result in an incomplete understanding of the broader implications of economic activities on the planet and society (Velenturf, & Purnell, 2021).

Inadequate Policy Frameworks: If the Circular Economy model is primarily concerned with economic gains, policy frameworks derived from this model may not adequately address environmental and social issues. This could hinder the development of comprehensive policies that strive for a balanced triple bottom line, encompassing economic, environmental, and social considerations (Ghisellini et al., 2016).

Potential for inequitable outcomes: The lack of emphasis on a triple-bottom-line approach may exacerbate social inequalities and environmental injustices. If economic prosperity takes precedence without proper consideration of social and environmental factors, the benefits of circular practices might not be distributed equitably across society (Amorim de Oliveira, 2021).

Missed opportunities for innovation: The limitations of the Circular Economy model could result in missed opportunities for innovative solutions that integrate economic, environmental, and social considerations. A narrow focus on economic aspects may discourage research and development in areas that could contribute to a more sustainable and inclusive future (Pieroni et al., 2019).

Business practices and social responsibility: Businesses may not feel compelled to adopt circular practices beyond economic considerations if the model does not explicitly promote a triple-bottom-line approach. This could impact organizations as companies, SMEs and other organizational forms might prioritize economic gains over environmental and social responsibility (Svensson et al., 2018).

The identified limitations of the circular economy model create a gap in research. Scholars may need to explore alternative innovative forms and frameworks that better integrate economic, environmental, and social dimensions considering new organizational and production models. This can pose a challenge to the academic community to develop more comprehensive and nuanced theories of Circular economy

Addressing these limitations could pave the way for more holistic, sustainable, and equitable approaches to economic activities and resource management (Velenturf, & Purnell, 2021).

Since business and management literature in this field is scarce, it is essential to include other trajectories within the CE agenda, from a managerial standpoint, to go beyond the common definition that CE has taken within our society. For this reason, this thesis wants to highlight the importance of stimulating new innovative and organizational forms in a post-modernist society with the aim to overcome social and environmental problems deriving from our current economic system. Following this perspective, at the city level, Bonomi et al. (2016) have written the treatise *La società circolare: fordismo, capitalismo molecolare, sharing economy (*The Circular Society: Fordism, molecular capitalism, sharing economy) explaining how in Italy is essential to include active citizenship in production and decision making-processses since there is no Smart city if there is no city of sharing.

Instead, Melanie Jaeger Erben et al. (2020) argue that the classical CE concept has four main limitations:

1) Ce is insufficient for achieving sustainable development due to the rebound effect supported by Korhonen et.al, (2018).

2) In the classical CE concept, citizens do not have an active role in the management of natural resources (Genovese & Pansera, 2020).

3) Most CE studies ignore people at the bottom of the pyramid who cannot afford the cost of industrial products because it is too high compared to their income, supported by Gupta (2020).

4) CE mainly contributes to incremental innovation by improving manufacturing processes. Instead, grassroots innovations and new organizational forms may bring disruptive innovations outside of their niche by combining grassroot entrepreneurship with entrepreneurial ecosystems (Suchek et al., 2021).

For these reasons, Jaeger Erben et al. believe that it is necessary to broaden the definition of CE to a multidimensional and holistic construct.
Therefore, this thesis aims to provide a specific type of organizational and innovative forms and that encourage human society to undertake a path more aligned with long-term sustainability, giving equal importance to environmental, social, and economic aspects to create a Circular Society.
This concept is described by the conceptual framework of Jaeger-Erben et al., (2020).
This framework is based on the principles of accessibility and transparency, democratization and empowerment, collaboration, and communalism, as well as social innovativeness and creativity.
These principles underscore the premise that grassroots-driven sustainable innovations that include new stakeholders in natural resource management can stimulate the emergence of new economic models more in line with long-term sustainability' (Seyfang & Smith, 2007; Bocken, et al., 2014; Sengers et al., 2019).
Therefore, My goal has been to bring tangible evidence of the problems that limit the birth of the Circular Society. For this reason, this thesis presents a series of case studies that adopt a qualitative research approach in such a way as to be able to analyze from the inside the problems and characteristics of different forms of grassroots innovations
Indeed, according to the theory ofecological economics, it is necessary to stimulate innovative processes that go beyond the classic market models which alone cannot be sustainable in the long term (Costanza et al., 1997).

1.3 General statement of the research problem

This thesis is a set of papers, book chapters, and conference papers elaborated during the doctoral period (3 years) that derives from personal considerations and reflections concerning the importance of considering new innovative processes for achieving long-term sustainability. More in detail, this thesis considers all the declinations of sustainable innovations (institutional, social, and eco-innovations) re-interpreting these innovative forms according to the lens of the Circular Society through a grassroots approach (bottom-up). As a sustainable project manager, I have an academic, professional, and personal interest in spreading the importance of grassroots innovations within the academic and entrepreneurial worlds. My goal is to so contribute to the realization of a sociery that is fairer and more sustainable.
More specifically, speaking with other bottom-up researchers and innovators, it seems clear that other practitioners and researchers are dealing with a series of problems for implementing grassroots innovation to create the Circular Society.

First, from an institutional point of view, there are no policies that support this societal model. Second, from a social point of view, the involvement of new actors such as communities within production processes creates more conflicts between different stakeholders who have divergent goals.

Furthermore, given my previous background as a project manager with experience in forms of social innovation in disadvantaged contexts, I have acquired extensive knowledge on new types of innovation and organizational forms, such as solidarity purchasing groups, energy communities and fab labs. More specifically, I have focused my research on institutional and social issues that challenges and obstacles innovators in creating bottom-up processes that can be replicated or scaled. As a researcher, I have examined this field through a detailed literature review and case studies.

For this reason, my goal has been to bring tangible evidence of the problems that limit the birth of the Circular Society. For this reason, this thesis present a series of case studies that adopt a qualitative research approach in such a way as to be able to analyze from the inside the problems and characteristics of different forms of grassroots innovations.

1.4 Focus of Research

This thesis focuses on new organizational forms that aim to disseminate grassroots innovations to transform our society into a more equitable and inclusive society according to the principles of the Circular Society.

The role of different forms of sustainable Grassroots innovations will be deeply analyzed in Chapter 2 showing how this type of innovation can promote new economic and social models.

Starting from these considerations, this collection of papers proposes a new social model starting from the analytical framework discussed in Chapter 3. This framework can support the diffusion of grassroots innovations that adhere to certain principles.

The ten papers that serve as the foundation for this thesis, as shown in Figure 1, examine a wide range of interconnected and relevant themes described in detail in Chapter 4.

Paper	Key Themes
Work One	*systems thinking, grassroots movements, transition cities, sustainable cities, multi-stakeholder analysis*
Work Two	*grassroots innovations, sustainability, entrepreneurial ecosystems, social innovation, multi-stakeholders' engagement*
Work Three	*energy Trilemma Index, energy sustainability, education, sustainable innovativeness, energy management*
Work Four	*renewable RECs, Degrowth, responsible innovations, sustainability*
Work Five	*circular management, AI, circular business models, responsible innovations, ethic business model canvas*
Work Six	*sustainable innovations, disruptive innovations, blockchain, business ethics, new organizational forms*
Work Seven	*digital entrepreneur, SMEs, digitalization, digital orientation*
Work eight	*Disruptive innovations, Sustainable development, grassroots innovations, social innovations*
Work nine	*Ecofeminism; Sustainable innovations; Alternative organizations; Degrowth*
Work ten	*Grassroots innovations; makerspaces; democracy; makerspaces; digital fabrication; open-source technology*

Table 1. Key Themes Within the Discourse of this Thesis

Chapter 5 shows the main results of thesis in the context of the Circular Society, showing how grassroots innovations, the energy transition, and new technologies play a primary role in the realization of this social model.

Instead, Chapter 6 explores theoretical, managerial implications and the policy implications of this collection of papers showing how the fields of grassroots innovations and Circular Society bring contributions to different domains. More specifically, this thesis analyzes the concept of Circular Society showing all the five main stakeholders involved in the realization of this social model through the creation of grassroots innovations. More specifically, this model is a reworking of the quintuple helix model: academia, industry, institutions, communities and active citizens, and environment. However, while these domains are interconnected, their influence in the realization of the Circular Society equal is not the same (Figure 2). In this paradigm, the communities and active citizens and environmental helix occupy a dominant position, while industry, academia and the government support these stakeholders. Furthermore, unlike the classic quintuple helix model, the environment does not appear to be the container of the other helices. In fact, the environment with its characteristics not only directly shapes the Circular Society given the natural characteristics of the territory but also allows the development of specific forms of grassroots innovations.

In addition to exploring these helixes in-depth, Chapter 6 also examines the fundamental role of policy implications, emphasizing how ad communities and active citizens, the environment, policymakers, and industries plays an important role in the diffusion of grassroots innovations for realizing the Circular Society.

Finally, chapter 7 describes the main limitations of this thesis and outlines what future research directions should be.

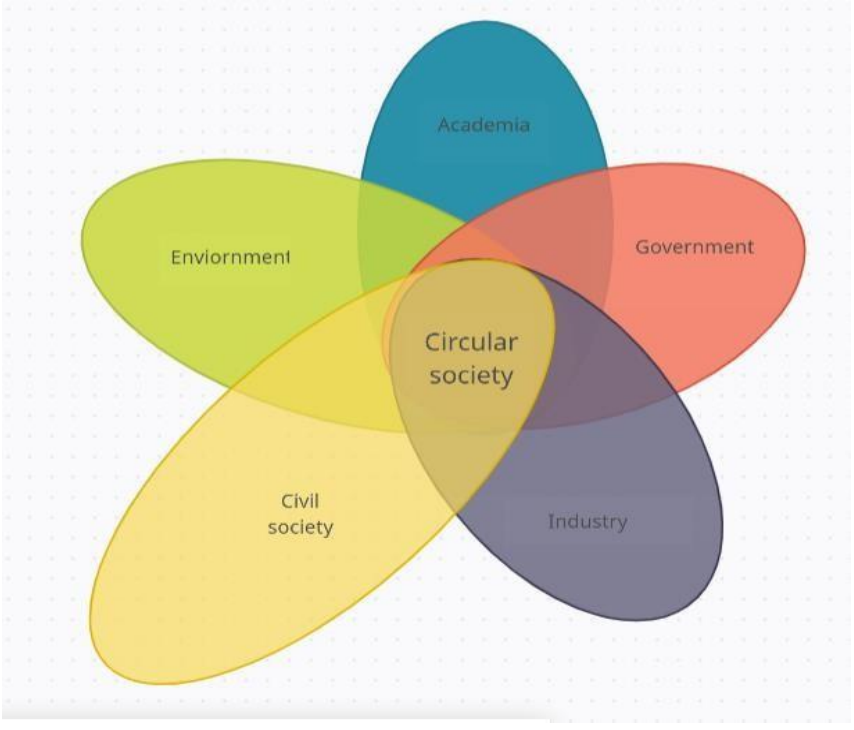

Figure 1: Domains Within the Field of Circular Society: Revised quintuple helix

1.4.1 Research aim

The purpose of this research is to contend that to achieve long-term sustainability, it is crucial to explore new production and consumption models that integrate diverse stakeholders into innovative processes, transcending traditional market models (Costanza et al., 1997). My overarching goal is to contribute to the realization of a society that is fairer and more sustainable by investigating the challenges and opportunities within the Circular Society framework. To accomplish this, the research aims to uncover the characteristics and limitations integral to creating a Circular Society. The subsequent presentation of case studies on grassroots innovations want to provide tangible evidence and deeper insights into the obstacles hindering the emergence of a Circular Society, aligning with the broader goal of promoting sustainable and inclusive societal transformation.

1.4.2 Research objectives

To satisfy the research aim, the research objectives of this study are outlined as follows:

RO1: Understanding the characteristics of cities and ecosystems that follow the Circular Society principles.

RO2: Understanding the role of energy transition in the context of Circular Society.

RO3: Understanding the role of artificial intelligence in the context of Circular Society.

RO4: Showing the different organizational forms that spur grassroots innovations for realizing the Circular Society.

RO5: Understanding the relationship between grassroots and sustainable innovations.

RO6: Understanding what the key sectors for creating a Circular Society.

RO7: Understanding the main limitations that inhibit the birth of a Circular Society.

1.5 Definitions of terms

Alternative organizations: unconventional ways of structuring and creating entrepreneurship, deviating from traditional methods. They encompass unique approaches to decision-making, communication, resource allocation, and goals. These organizations arise in response to limitations of traditional approaches and include cooperatives, open-source projects, and community-based initiatives, among others (Parker et al., 2014).

Circular Society: The Circular Society is a societal vision where sociosphere, ecosphere and technosphere are in balance. For this reason, economic practices have the specific and exclusive goal to produce social well-being within planetary boundaries (Jaeger-Erben et al., 2020).

Degrowth: Degrowth promotes equality, sustainability, and well-being while opposing the pursuit of unrelenting economic growth. It aims to move away from economies that want increase consumption and the GDP putting the needs of people and ecological balance first. This idea advocates for fewer working hours, local production, and stronger communities while proposing a new definition of prosperity that goes beyond GDP. With the help of resource redistribution and a new vision for progress, it seeks to address environmental issues and promote social justice (Kallis et al., 2018)

Eco-innovations: Eco-innovations refer to innovative forms that explicitly emphasize a reduction in environmental impact, whether or not this effect is intended. Additionally, it encompasses innovation in social and institutional structures in addition to innovations in products, processes, marketing strategies, and organizational methods (Kesidou & Demirel, 2012).

Ecological economics: This field combines ecological and economic theories to investigate how human economies and the environment interact. By considering the limited resources and services offered by ecosystems, it aims to develop sustainable approaches to economic activities. By highlighting the significance of ecological well-being and long-term environmental sustainability in determining economic systems and human well-being, this field challenges conventional economic models (Costanza et al., 1997).

Grassroots entrepreneurial ecosystem: A grassroots entrepreneurial ecosystem is a system of connected, locally motivated initiatives that nurture and promote the development of new businesses and innovative forms at the community level. It is distinguished by the fact that initiatives, partnerships, and resources are created and developed by people, groups, and communities within a particular geographic area (Juma et al., 2023)

Grassroots innovations: Grassroots innovations are locally driven solutions emerging from communities to address specific challenges for achieving long-term sustainability. These innovations frequently focus on the user, are collaborative, and are resource-conscious with the goal of having a positive social, environmental, and economic impact. Examples include locally customized agricultural techniques, renewable energy communities, and healthcare programs supported by the community. They demonstrate how inventiveness on a local level can produce practical solutions with the potential to have an impact on a large-scale (Seyfang & Smith, 2007).

Institutional innovations: Institutional innovations are new changes to long-standing structures, procedures, or rules within organizations or societies. Traditional norms, practices, and governance are transformed by these innovations to respond to new difficulties or opportunities. They frequently introduce new organizational frameworks, policies, or procedures in an effort to increase effectiveness, responsiveness, and efficiency. These changes are essential for institutions to advance and to adapt to changing environments (Weber & Rohracher, 2012).

Multi-stakeholder' engagement: The Multi-stakeholder' engagement is the inclusive involvement of diverse individuals and organizations to collaboratively address complex issues, make decisions, and develop effective solutions. This approach fosters transparency, inclusivity, and shared responsibility for achieving sustainable outcomes (Pereno & Eriksson, 2020).

Social innovations: Social innovation are defined as innovative services and activities driven by the desire to address a social need. This type of innovation occurs across a variety of organizational forms, from for-profit businesses that frequently generate social value through their CSR programs to no-profit organizations that create new organizational models (Phillips et al., 2015)

Sustainable innovations: Sustainable innovations create new ideas, objects, or improvements in technology that advance society, the environment, and the economy. It emphasizes environmentally friendly behaviors and social progress. The use of alternative energy sources, circular economy strategies, green construction, eco-friendly transportation, and social enterprises are some examples. Their goal is to achieve holistic progress by considering the interconnectedness of economic, social, and environmental factors (Schaltegger & Wagner, 2011).

Transition cities: Transition cities are grassroots community projects, at city level, which aim to increase community self-management, sustainability, and resilience in response to challenges like climate change and resource depletion. They involve local communities to reduce reliance on fossil fuels and promote environmentally friendly practices. (Smith, 2011).

1.6 My research journey

My research interests broadly focus on social innovation, disruptive innovations, and grassroots innovations for sustainability analyzed under the managerial lens. After a work experience on technologic agriculture and bio-architecture as a project manager, I decided to start a Ph.D. to stimulate the diffusion of grassroots innovations to help local realities towards a self-production and self-consumption of basic needs. Currently, I collaborate with Torino City Lab of the municipality of Turin for the implementation of a smart and inclusive city.

1.6.1 Author biography

Considering my background in economics, environmental sciences, sustainable development, and my role as a Project Manager specializing in bioconstruction, agriculture, and social innovations my main aspiration is to encourage the realization of innovative projects based on the values of the circular economy and sustainability, integrating them into new one's organizational models. This predilection has me led to develop an interest in Europlanning in the fields of technology transfer and international cooperation. Considering my aspirations, I decided to pursue a Ph.D. in Innovation for the Circular Economy to improve my theoretical knowledge on Grassroots Innovations. My skills of research focus on qualitative methodologies through the analysis of various case studies.

1.6.2 The PhD by Publication pathway

The approach of a Ph.D. by Publication (PhDP) diverges from the traditional PhD model, as it involves a collection of academic publications, which could be in the form of book chapters, conference papers, or peer-reviewed papers. These publications may have been published, accepted, or are currently undergoing the review process for publication. The PhDP has gained significant traction within academia, challenging conventional norms (Wilson, 2002). However, the uniqueness of the PhDP lies in its retrospective evaluation of an existing body of work, already subjected to dissemination (Davies and Rolfe, 2009). A pivotal consideration for this pathway is ensuring that the compilation of publications maintains internal consistency and cohesively constructs a coherent research portfolio (Badley, 2009). In contrast to the conventional model, the PhDP emphasizes collaborative research through co-authorship, contributing to both the advancement of practice and the exchange of knowledge (Kamler, 2008). Given its collaborative nature, multi-authored publications are commonplace in the PhDP portfolios, with the assurance of credibility and validity resting upon the individual contribution of the candidate to each work (Wilson, 2002). When presenting the body of work for a PhDP claim, the individual publications have already undergone extensive scrutiny and analysis within the broader research community. This rigorous review process

occurs beyond the realm of supervisory guidance (Robins and Kanowski, 2008). As such, the assertion of a PhDP claim is rooted in this foundation. In the case of the current PhDP claim, it is established on the premise of a compilation of papers that have navigated a thorough evaluation by the research community and undergone rigorous critique, aligning with the distinctive attributes of the PhDP pathway.

From an epistemological standpoint, this thesis falls within the realms of constructivism and rationalism. As a constructivist researcher, I deeply engaged with participants to grasp their viewpoints, motivations, and the societal processes driving grassroots innovations.

On the one hand, this approach recognizes that grassroots innovators possess existing knowledge influenced by their social and cultural surroundings. They construct knowledge from their personal experiences, a central theme presents in the individual paper contained in this thesis.

On the other hand, a part of this research adopts a rationalistic approach, through logical deduction to gain knowledge. Instead, this thesis employs a deductive approach. The overall strategy aligns with action research, acknowledging the researcher's immersion in the studied fields. Various strategies, including case studies, literature reviews, interviews, and regression models, were employed across the ten papers to address research questions. Although a consistent single method was used for each paper, both qualitative and quantitative approaches were chosen based on each study's aim. The central themes of Circular Society have been studied through the analysis of grassroots innovations, focusing on aspects of Degrowth, and multi-stakeholder engagement through the analysis of cities, sectors, academic and industry domains. The grassroots innovative forms are analyzed with a focus on the domains of sustainable innovations (institutional, eco, and social innovations) across different papers. The connections between these papers are thoroughly explored in Chapter 4.

1.7 Methodological approach

This section highlights the analytical framework applied in this study. The Thematic Map of the Project (table 2) articulates the chronology of publications, the methodology used for each paper, the key themes, and the relationship between these papers and the Circular Society that explores the relevant core concepts developed by Jaeger-Erben et al. (2020).

Table 2: Thesis thematic map

Work	1	2	3	4	5	6	7	8	9	10
Typology	Proceeding	Book chapter	Peer-reviewed paper	Proceeding	Book chapter	Peer-reviewed paper	Proceeding	Proceeding	Proceeding	Peer-reviewed paper
Title	Systems thinking for Sustainable Cities: A conceptual model to analyze Transition Cities	Exploring Grassroots Innovation for Sustainable Development in Entrepreneurial Ecosystems	The impact of education on the Energy Trilemma Index: A sustainable innovativeness perspective for resilient energy systems	Renewable energy communities and Degrowth: participative governance for energy management	Dal Management Lineare al Management Circolare: l'Intelligenza Artificiale che Curva la Catena del Valore	A systematic literature review of Blockchain for disruptive sustainable innovations: A new Conceptual Framework	Blockchain for Disruptive eco-innovations: A multiple case study for alternative forms of waste management	Sustainable disruptive innovations: grassroots innovations for social and circular entrepreneurs	Ecofeminism and entrepreneurship: The case study of People's Bank of Govanhill	Fab Labs for Sustainable Cities of the Future: Re-evaluating the Smart City Concept
Publication	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
Methodology	Conceptual	Conceptual	Quantitative	Case study	Conceptual	Thematic analysis	Conceptual	Case study	Case study	Case study
Key themes	*Systems thinking, Grassroots movements, Transition cities, Sustainable cities, multi-stakeholder analysis*	*grassroots innovations, sustainability, entrepreneurial ecosystems, social innovation, multi-stakeholder engagement*	*Energy Trilemma Index, energy sustainability, education, sustainable innovativeness, energy management*	*Renewable energy community, post-growth, responsible innovations, sustainability*	*circular management, AI, circular business models, responsible innovations, ethical business model canvas*	*sustainable innovations, disruptive innovations, blockchain, business ethics, new organizational forms*	*digital entrepreneur, SMEs, digitalization, digital orientation*	*Disruptive innovations, Sustainable development, grassroots innovations, social innovations*	*Ecofeminism; Sustainable innovations; Alternative organizations; post-growth*	*Grassroots innovations; makerspaces; democracy; makerspaces; digital fabrication; open source technology*
Jaeger-Erben Theory	Accessibility, empowerment communality	Transparency. democratization collaboration	Accessibility empowerment social-innovativeness	Accessibility, empowerment creativity	Transparency, democratization creativity	Transparency democratization empowerment social-innovativeness creativity	Accessibility democratization empowerment creativity	Transparency, empowerment communality social-innovativeness	Accessibility democratization, communalty social-innovativeness creativity	Accessibility transparency democratization empowerment communality creativity

1.8 The submissions

The University of the Turin outline the process for obtaining a PhD by Research Publication. This approach necessitates the submission of research papers and other publications, which are then combined into a complete thesis via an extensive critical narrative. This submission will be based on a portfolio of three peer-reviewed, published works, consisting of one journal paper and two book chapters, two research papers that are still being reviewed, and five conference proceedings. Through this overarching critical narrative piece, all 10 publications are then connected to the shared themes of grassroots innovations and the Circular Society. Each publication brings contributions to the fields

and together with the other publications forms a structured and coherent body of work. This thesis was completed over the course of about three years. Of the ten publications that the researcher contributed to, in nine I am the lead author, and one I was a co-author. Two papers are under review on three* ABS journals, one paper was published in a class* A journal but was not ranked by ABS. Two additional papers were released as book chapters in entrepreneurial texts that contained the research of reputable entrepreneurship authors. Finally, the five conference proceedings have been published by leading conferences in management research such as Euromed and ICTMOD.

1.9 Main Contributions

This thesis is a collection of studies motivated by the researcher's observations, attitudes, and behaviors difficult to understand within the outside productive world. For this reason, this thesis could not have been written by another. I can provide insight into this area of study from all perspectives as a student, sustainable project manager, and active researcher. The approaches, models, and techniques in this thesis, however, are also useful as a guide for research-based practice. As a result, they are relevant to entrepreneurship and innovation educators who are focused on developing new organizational and innovative forms while respecting the planetary boundaries.

As a result, this thesis contributes to two main ways.

First, this study identifies and explores grassroots innovations from a holistic point of view at different scales highlighting the key sector where it is necessary to implement new production and consumption models to create the Circular Society. Although different researchers, entrepreneurs, and citizens have been involved in or have analyzed this issue, the phenomenon still needs to be investigated given that various stakeholders involved have different interests, points of view, and backgrounds.

Second, this thesis provides practical examples that include different stakeholders in the production processes. The 10 papers presented here described a new framework to support the development of the Circular Society (with specific characteristics) based on grassroots innovations. This new approach, grounded in current research around the Circular Society, adopts a practice-based approach that is also rooted in grassroots sustainable entrepreneurship. Key theories such as Degrowth, disruptive sustainable innovations, and multi-stakeholder engagement through a practitioner-academic approach have been analyzed to propose a model that can be replicated or scaled-up to achieve long-term sustainability.

1.10 Summary

This chapter provided background information of this thesis by describing the researcher's and the thesis's Circular Society research journey. The methodological approach is described, and the justification for the decisions is given. There is a summary of the entire submission, and the work's overall contribution to the fields of the Circular Society and grassroots innovations is mentioned. Chapter 2 will provide an overview of the theoretical landscape of grassroots innovations and their characteristics summarizing their link with sustainable innovations and with the principles of the Circular Society.

The theoretical landscape

Chapter Two

2.1 Introduction

The previous chapter provided background information on this thesis by outlining the researcher's and this thesis's research journey.

The methodological approach was described, and the justification for the decisions was given. The entire submission was summarized, and the work's main contributions to the fields of Circular Society was stated. Instead, by summarizing important grassroots innovation paradigms within the fields of The Circular Society, ecological economics, Degrowth and sustainable innovations based on research from paper One to paper Ten, this chapter will present an overview of the theoretical landscape of grassroots innovations for implementing a Circular Society.

Table 3 shows the main authors and paper of the themes of this thesis.

ECOLOGICAL ECONOMICS and DEGROWTH
(Altieri & Toledo, 2011); (Asara, et al., 2015); (Banerjee et al., 2021); (Bauhardt, 2014); (Brand-Correa et al., 2022); (Cockburn, et al., 2018); (Costanza et al., 1997); (Daly, 1991); (De Jesus & Mendonça, 2018); (Dodds, 1997); (Ferguson, 2018); (Gorz, 1994); (Grin et al., 2010); (Hermans et al., 2016); (Kallis, 2011); (Kallis, 2019); (Khmara & Kronenberg, 2020);(Krueger et al., 2018); (Martínez-Alier et al., 2010); (Nogueira & Wallig, 2022); (Pansera, & Fressoli, 2021); (Paulson, 2017); (Rockström, et al., 2009); (Rommel et al., 2018); (Schouten et al., 2012); (Schulz & Bailey, 2014); (Spekkink et al., 2022)
GRASSROOTS INNOVATIONS
(Akenji, 2014); (Bauwens et al., 2020); (Buechler et al., 2015); (Cohen & Muñoz, 2015); (Connors & McDonald, 2011); (Dyck & Silvestre, 2018).; (Fischer et al., 2021); (Fressoli et al., 2014); (Gernert, et al., 2018); (Gutberlet, 2018); (Hermans et al., 2016); (Hoicka et al., 2022); (Hossain, 2016); (Joshi & Yenneti, 2020); (Joshi & Yenneti, 2020); (Levänen, et al., 2022); (Martin, 2016); (Matthies, et al., 2019); (Pansera, M., & Sarkar, 2016); (Pastakia, 1998); (Sage et al., 2021); (Schouten et al., 2012); (Seyfang & Smith, 2007); (Seyfang & Haxeltine, 2012); (Seyfang et al., 2014; (Seyfang, 2010; (Seyfang, 2010); (Seyfang & Longhurst 2013; (Smith et al., 2016); (Smith, et al., 2014); (Suriyankietkaew, et al., 2020); (Taylor, et al., 2020).
CIRCULAR SOCIETY
(Jaeger-Erben et al., 2021); (Jaeger-Erben et al., 2018); (Melles, 2021); (Leipold, et al., 2021); (Svenfelt et al., 2019); (Wahlund & Hansen, 2022); (Raworth, 2017); (Rizos et al., 2016); (Medina-García et al., 2021); (Echefaj et al., 2023); (Bocken & Short, 2021); (Villalba-Eguiluz et al., 2023); (Clube & Tennant, 2023); (Kirchherr, et al., 2023); (Spekkink et al., 2022); (van Bueren et al., 2023); (Calisto Friant et al., 2023); (Nogueira & Wallig, 2022); Hermann et al., 2022); (Milios, 2022); (Jensen et al., 2022): (Sonnier & Grit, 2022); (Scuotto, et al., 2023); (Del Giudice et al., 2022); (Del Giudice et al., 2023); (Konno & Schillaci, 2021); (Chavez-Miguel et al., 2022).
CIRCULAR ECONOMY
(Ghisellini et al., 2016); (Korhonen et al. 2018); (Korhonen et al., 2018); (Lüdeke-Freund et al., 2019); (Mavi & Mavi, 2019); (Winans et al., 2017).
SUSTAINABLE INNOVATIONS
(Celata & Sanna, 2019); (Dias & Partidário, 2019); (Edwards-Schachter, 2018; (Evans et al., 2017); (Geels, 2019); (Hermans et al., 2016); (Mariani et al., 2022); (Martin, 2016); (Moallemi et al., 2020); (Rowan & Galanakis, 2020); (Schaltegger & Wagner, 2011); (von Schönfeld & Ferreira, 2021); (Wu & Si, 2018).
INSTITUTIONAL INNOVATIONS
(Ahlstrom et al., 2020); (Fukuda-Parr et al., 2013); (Geels, 2019); (Geels, 2004); (Gifford et al., 2021); (Gunningham, 2017); (Hargrave & Van de Ven, 2006); (Hoppe et al., 2015); (Irvin, & Stansbury, 2004); (Kezar, 2012); (Kiparsky et al., 2013); (Kiparsky et al., 2013); (Leeuwis et al., 2021); (Smith & Raven, 2012); (Smith, & Stirling, 2018); (Sun et al. 2019); (Tidd & Bessant 2020); (Ward et al., 2015).
ECO-INNOVATIONS
(Avelino et al., 2022); (Buhl et al., 2016); (Canwat, & Onakuse, 2022); (Carrillo-Hermosilla et al., 2010); (Chistov et al. 2023); (Dudek & Wrzaszcz, 2020); (Durán-Romero et al., 2020); (Eitan et al., 2023); (Eitan et al., 2023); (Fastenrath & Braun, 2018); (Fressoli et al., 2014); (Hansmeier, 2021); (Hazarika & Zhang, 2019); (Horbach et al., 2012); (Kraus et al., 2017); (Pansera & Owen, 2014); (Sarkar & Pansera, 2017); (Solis-Navarrete, 2015); (Sovacool, & Brisbois, 2019); (Stamm et al., 2017)
SOCIAL INNOVATIONS
(Angelidou & Psaltoglou, 2017); (Chen, & Qu, 2020); (Edwards-Schachter et al., 2012); (Ellis,2010). (Grimm et al., 2013); (Hoppe & De Vries, 2018); (Kar, et al., 2019); (Manzini, 2015). (Morawska-Jancelewicz, 2022); (Mulgan, 2006); (Santos, 2012); (Tarde, 2010); (Varadarajan & Kaul, 2018); (Westley, et al., 2014); (Wu & Si, 2018).
KNOWLEDGE MANAGEMENT and INTELLECTUAL CAPITAL
(Atiku, 2020); (Bougoulia & Glykas, 2023); (Chopra et al., 2021); (Deng et al., 2023); (Pesce et al., 2020); (Santoro et al., 2018); (Secundo, et al., 2020); (Zambon, & Monciardini, 2015).

Table 3: Main authors and main papers

2.2 The relationship between the Circular society, ecological Economics, Degrowth, and grassroots innovations, intellectual capital and knowledge management

This section will show the relationship between the Circular society, ecological Economics, Degrowth, Circular Society, and grassroots innovations. These concepts are interconnected and contribute to a broader understanding of how sustainable and resilient societies can be created.

In summary, Ecological economics challenges conventional economic paradigms, while the Circular society provide practical solutions (Martínez-Alier et al., 2010; Prieto-Sandoval et al., 2016).

Degrowth ideologies question perpetual growth, and the circular society exemplify alternative models of production and consumption (Schröder et al., 2019; Pansera, & Fressoli, 2021).

The grassroots innovations support the Circular Society envisions the holistic transformation of society based on a balance between ecological, social, and economic systems and grassroots innovations embody these principles (Jaeger-Erben et al., 2020).

In conclusion, these concepts offer pathways toward a more equitable, resilient, and ecological society. However, several challenges remain in scaling-up grassroots innovations and embedding these principles into decision-making processes.

2.3 Alternative economic models and circular society

This section discusses the relationships between alternative economic models and circular society, focusing on the ecological economy, the Degrowth paradigm and the grassroots innovations.

In the context of ecological economics, this thesis highlights how ecological economics challenges traditional economic paradigms and underlines the need to integrate ecological and economic systems to achieve long-term sustainability. The circular society is supported by networks of activists and organizations that generate solutions to sustainability challenges, aligning with ecological economics principles of equitable distribution of resources (Leipold, et al., 2021).

In the section regarding the Degrowth paradigm, it is explained how this paradigm rejects the idea that perpetual economic growth brings well-being to the civil society and improves environmental sustainability. According to this perspective, the circular society challenge the consumerist model by promoting a more ethical use of resources, detaching themselves from the concept of economic growth by offering practical examples of alternative and sustainable lifestyles (Jaeger-Erben et al., 2021).

Finally, the section regarding of the Circular Society shows how it is necessary to implement a holistic social transformation in which ecological, social, and economic systems operate in harmony. Grassroots innovations in this context play a key role in pushing forward this transition, showing alternative consumption patterns and production models that align with the principles of the Circular Society (Jaeger-Erben et al., 2020).

In conclusion, grassroots innovations are practical examples of how to implement alternative economic models, offering tangible solutions to create more fair, resilient, and ecological healthy societies. However, it is also recognized that there are different challenges that limit the inclusion grassroots initiatives into mainstream economic and political strategies.

2.3.1 Ecological economics and circular society

In an era defined by the intricate interplay of environmental degradation and socio-economic development, the dynamic relationship between ecological economics and the circular society has gained prominence as a promising avenue for achieving sustainable and resilient societies (De Jesus & Mendonça, 2018; Melles, 2021).

On one hand, ecological economics challenges the traditional economic paradigm that treats the environment as an external entity. The main exponents of this theory Herman Daly (1991) argue that it is necessary to integrate ecological and economic systems recognizing that our planet has finite resources that must be conserved to achieve long-term sustainability. Therefore, Ecological economics offers analytical tools for assessing the intricate links between economic paradigms, environmental degradation, and societal well-being (Costanza et al., 1997). This reorientation aligns with the recognition of planetary boundaries, which delineate the safe operating space for humanity within Earth's ecological systems (Rockström et al., 2009).

The Circular Society envisions a social-ecological transformation beyond traditional economic growth narratives, emphasizing fair distribution, diverse approaches, and active participation to achieve sustainability, social justice, and communality (Jaeger-Erben et al., 2021). Therefore, both ecological economics and the Circular Society concept emphasize the need for a social-ecological transformation.

First, the Circular Society entails moving beyond purely economic considerations and incorporating social dimensions, aligning with the interdisciplinary nature of ecological economics (Velenturf & Purnell, 2021).

Second, the Circular Society critiques the CE for its perceived lack of concern for social sustainability. The Circular Society concept responds to this critique by explicitly placing social reorganization as necessary for achieving circularity. This resonates with ecological economics, which highlights the importance of social well-being alongside ecological health (Dodds, 1997; Raworth, 2017).

Third, the various approaches within the Circular Society, such as "new prosperity narratives" and "Transformative the Circular Society," reflect a diversity of perspectives on how to achieve a circular society (Jaeger-Erben et al, 2020). This diversity aligns with ecological economics, which recognizes the complexity of socio-ecological systems and the need for diverse strategies to address environmental and social challenges (Norgaard et al., 2009).

Forth, some approaches within the Circular Society, such as "Economic Reorganization," stress the importance of fair distribution of power and resources. This resonates with ecological economics, which advocates for just and equitable distribution of resources and benefits within society Bell et al., 2020).

Fifth, the Circular Society emphasizes the need for fostering agency rather than passivity, encouraging participation in circular systems. This aligns with ecological economics, which calls for community involvement, bottom-up initiatives, and participatory decision-making in environmental and economic governance (Bauwens et al., 2020).

Sixth, both ecological economics and the Circular Society want to challenge the prevailing capitalist principles and meanings of economic practices. They advocate for alternative narratives rooted in environmental and social sustainability, social justice, solidarity, and communality (Elsen 2018;

In summary, the relationship between ecological economics and the Circular Society concept lies in their shared emphasis on social-ecological transformation, concerns for social sustainability, diverse approaches, fair distribution, fostering agency, and a challenge to capitalist principles. Both concepts converge in their recognition of the interconnectedness of ecological and social systems in shaping a sustainable and just future.

2.3.2 Degrowth and circular society

The relationship between the Degrowth paradigm and Circular society consists of a relationship among their values.

First, the Degrowth paradigm challenges the traditional focus on perpetual economic growth, emphasizing the need to prioritize human well-being, ecological sustainability, and equity (Asara et

al., 2015). Indeed, Scholars like George Kallis argue that unlimited growth is incompatible with planetary boundaries and advocate for steady-state economies. This paradigm recognize that uncontrolled growth increases ecological degradation, social inequality, and resource depletion (Bauhardt 2014; Banerjee et al., 2021). In response to the limitations of growth-centric models, the concept of Circular Society introduced the concept of an alternative society that goes beyond growth, technology, and market-based solutions (Leipold, et al., 2021). Indeed, the Circular society includes approaches that integrate ideas from post and degrowth debates. It implies a departure from the conventional pursuit of economic growth and explores alternative notions of prosperity and that do not rely solely on material wealth (Jaeger-Erben, 2020; Krueger et al., 2018; Khmara & Kronenberg, 2020).

Second, the Circular society framework highlights the need to circularize the distribution of power and resources, aligning with degrowth principles that advocate for a reduction in material and energy throughput (Jaeger-Erben, 2021). It challenges the concentration of wealth and resources in certain sectors (Bauwens et al., 2020).

Third, the Circular society aligns with degrowth principles by emphasizing the central role of participatory and bottom-up approaches (Jaeger-Erben, 2020). It involves social innovation emancipatory consumer movements and the democratization of innovation contributing to the reconfiguration of production and consumption systems towards regional and participatory models (Banerjee, et al., 2021).

Fourth, Both degrowth and CS (as the ecological economics concept) challenge prevalent capitalist principles (Spekkink et al., 2022). The circular society seeks to redefine economic action by prioritizing social justice, equity, and inclusion over material prosperity. This aligns with the degrowth movement's critique of the pursuit of endless economic growth (Ferguson, 2018).

Fifth, the Circular Society concept challenges the simplistic model of human needs inherent in current linear systems, advocating for people as 'embedded' in complex systems rather than passive recipients (Nogueira & Wallig, 2022). This aligns with the degrowth perspective, which questions the consumerist lifestyle (Schulz & Bailey, 2014).

In summary, the relationship between the degrowth theory and the Circular Society concept involves a critique of growth-centric models and the exploration of alternative pathways that align with degrowth principles. The Circular society framework integrate key tenets of degrowth, emphasizing social transformation, distributional justice, and reevaluation of societal values beyond continuous economic growth.

2.3.3 Circular Society and grassroots innovations

The relationship between grassroots innovations and the Circular Society is an interaction that wants to disrupt the prevailing circular economic paradigm (Jaeger-Erben et al., 2020).
On the hand, the circular economy is focused on the improvement of the supply chains to reduce environmental depletion (Korhonen et al., 2018).
On the other hand, The Circular Society envisions a holistic societal transformation where ecological, social, and economic systems operate in harmony (Jaeger-Erben et al., 2021). Indeed, the Circular Society recognizes the interdependence between ecosystems, human well-being, and economic activities (Jaeger-Erben, 2020).
Grassroots innovations play a crucial role in promoting a transition towards this type of society by highlighting alternative lifestyles, consumption patterns, and production models that align with the Circular Society principles (Melles, 2021).
Furthermore, the notion of self-sustaining metabolism introduces a deeper dimension to the Circular Society concept. It calls for a shift from resource-intensive, linear economic practices toward regenerative, closed-loop systems (Raworth, 2017; Jaeger-Erben et al., 2020).
Grassroots innovations contribute to this transition by advocating for resource conservation, community-based production, and community self-management (Seyfang & Smith, 2007).
Examples include local food systems, upcycling workshops, and renewable energy communities that demonstrate the potential to create self-sustaining cycles within communities (Suriyankietkaew et al., 2022).
Moreover, the Circular Society advocate the recognition of non-monetary value, including social cohesion, cultural heritage, and ecosystem health (Leipold et al., 2021). The grassroots innovations align with these principles challenging the reductionist notions of the mainstream value creation by emphasizing the multifaceted dimensions of well-being beyond mere economic indicators (Dyck & Silvestre, 2018). Indeed, Grassroots innovations embody these principles through initiatives that foster community engagement, knowledge sharing, and environmental stewardship (Fischer et al., 2021).
Another key aspect of grassroots innovations, as said before, is the empowerment of local communities through bottom-up innovation that enable them to shape their sustainable futures. This empowerment aligns with the principles of democratization and empowerment that central to the Circular Society frameworks (Jaeger-Erben, 2019).
However, despite the synergy between grassroots innovations and Circular Society holds immense promise, several challenges remain. Indeed, scaling up grassroots initiatives to achieve systemic change requires challenging different institutional barriers and financial support (Buechler et al.,

2015). Therefore, integrating these concepts into mainstream economic and political frameworks is necessary to redefine well-being beyond GDP growth (Svenfelt et al., 2019). Indeed, the intricate relationship between grassroots innovations and Circular Society needs a profound transformation of contemporary socio-economic structures (see chapter three for more information).

By summary, the grassroots innovations embody principles of resilience and community engagement, which catalyze societal transitions toward the Circular Society (Zhang et al., 2018; Jaeger-Erben et al., 2020). The synergy between these concepts offers a pathway toward regenerative economies, holistic well-being, and sustainable livelihoods (Wahlund & Hansen, 2022).

Further research needs to explore innovative mechanisms for scaling up grassroots innovations embedding the Circular Society principles into policy for fostering a self-sustaining metabolism.

2.3.4 Circular Society, knowledge management and intellectual capital

The relationship between the Circular Society and the topics of knowledge management and intellectual capital is intricate and crucial for the success of the Circular Society model.

First, In the Circular Society, there is a shift from the traditional focus on monetary value creation to multi-dimensional progress measures. This includes considering social and ecological dimensions alongside economic ones. Intellectual capital, encompassing knowledge, skills, and innovation capabilities, becomes pivotal in measuring and fostering progress in these dimensions (Secundo et al., 2020).

Second, the Circular Society places importance on circular literacy, which involves holistic thinking, complexity management, and innovation capabilities. Knowledge management is essential for building and disseminating circular literacy. It involves capturing, organizing, and sharing knowledge about natural cycles, systemic thinking, and the intricacies of managing complexity within a societal context (Chopra et al., 2021).

Third, democratization in Circular Society extends to decision-making processes, involving a broader range of stakeholders. Knowledge management plays a critical role here by ensuring that relevant information is accessible to all participants. It includes documenting best practices, lessons learned, and relevant data, fostering an informed and participatory environment (Deng et al., 2023).

Forth, the Circular Society emphasizes collaboration and communality in economic activities. Intellectual capital, which includes both explicit and tacit knowledge, fuels innovation in collaborative efforts. Effective knowledge management systems facilitate the sharing of insights, expertise, and creative ideas among diverse stakeholders, leading to innovative solutions (Santoro et al., 2018).

Fifth, the accessibility, in the context of Circular Society, extends to equal access to information and education. Knowledge management ensures that information about sustainable practices, resource management, and circular economy principles is transparent and accessible. This transparency is crucial for building trust and accountability (Pesce et al., 2020).

Sixth, empowerment in Circular Society involves providing individuals with the skills and capabilities to actively participate in sustainable economic practices. Knowledge management supports this by facilitating training programs, knowledge-sharing platforms, and educational initiatives that enhance individuals' abilities to contribute to circular and sustainable initiatives (Atiku, 2020).

Seventh, social innovativeness and creativity are driven by knowledge creation and sharing. Knowledge management systems encourage the cross-disciplinary collaboration necessary for innovative solutions. They also document and disseminate successful innovations, fostering a culture of continuous learning and improvement (Bougoulia & Glykas, 2023).

In summary, knowledge management and intellectual capital are foundational to the successful implementation of the Circular Society model. They support the development of circular literacy, enable informed and participatory decision-making, foster collaboration, and drive innovation. Creating an ecosystem with the necessary knowledge that valorizes the intellectual capital is essential for building for eco and social innovation within the Circular Society framework.

2.4 Grassroots and disruptive sustainable innovations

This section wants to elucidate the intricate ways in which grassroots innovations can serve as disruptive catalysts, paving the way for the establishment of a circular society. As a form of bottom-up innovation geared towards sustainable development, grassroots innovation holds the transformative potential essential for the evolution from our existing society to the circular society model (Hermans et al., 2016). Given that these innovations empower us to fundamentally reshape the dynamics of natural resource exchange among diverse stakeholders, they inherently assume a disruptive role. Consequently, the primary aim of this section is to illustrate how grassroots innovations can embody sustainable disruptive innovations across various dimensions, thereby laying the foundation for a circular society rooted in these innovative forms (Geels, 2019; Jaeger-Erben et al., 2020).

More in detail, this section focuses on the connection between the concept of grassroots innovations and disruptive sustainable innovations, showing how grassroots innovations are a form

of disruptive sustainable innovations according to the three distinct typologies of sustainable innovations proposed by Stefan Schaltegger & Marcus Wagner (2011): institutional innovations, eco-innovations, and social innovations. Disruptive sustainable innovations challenge conventional paradigms by introducing new solutions that revolutionize industries and societal systems (Edwards-Schachter et al., 2018). These innovations often emerge from a desire to address pressing environmental and social challenges, through new technologies, business models, and approaches (Evans et al., 2017). The disruptive nature of these innovations has the goal to reshape existing norms and create new pathways for sustainability (Martin et al., 2016). Examples include renewable energy technologies, circular economy models, and regenerative agriculture practices (Rowan & Galanakis 2020). The synergy between disruptive sustainable innovations and grassroots initiatives is multi-dimensional and mutually reinforcing (Celata & Sanna 2019). Disruptive sustainable innovations often inspire grassroots movements by showcasing possibilities for transformative change (Seyfang et al., 2014; Dias, & Partidário, 2019). Grassroots initiatives, in turn, provide fertile ground for the adoption, adaptation, and diffusion of sustainable innovations within local contexts (Gernert et al., 2018) This reduces the gap between large-scale disruptive changes and localized implementations, ensuring that innovations resonate with diverse communities (Turnheim et al., 2015).

Furthermore, Grassroots innovations afford challenges and opportunities for specific communities. When sustainable innovations are applied and customized to suit local contexts, it increases their chances of acceptance, adoption, and long-term success.

Despite the three categories of sustainable innovations proposed by Schaltegger & Wagner (2011) are different, they show overlapping synergies in the context of disruptive innovation and grassroots initiatives. The relationship between these concepts is not confined. Indeed, they often blend and reinforce each other.

On one hand, disruptive sustainable innovations, regardless of their category, often benefit from grassroots initiatives that validate, refine, and amplify their impact (Wu & Si, 2018).

On the other hand, grassroots innovations, on the other hand, exploit disruptive sustainable innovations to propel their initiatives, adopting new technologies and strategies that align with their mission (von Schönfeld & Ferreira, 2021).

However, the connection between disruptive sustainable innovations and grassroots initiatives is not without challenges.

To maximize the potential of the connection between disruptive sustainable innovations and grassroots initiatives, supportive policy frameworks and collaborative platforms are crucial (Moallemi et al., 2020). Governments and institutions can incentivize disruptive innovations that

align with grassroots needs, providing funding, regulatory support, and platforms for knowledge exchange (Smith et al., 2016; Hojcka et al., 2022).

Therefore, harnessing the collective potential of these innovations necessitates strategic collaboration, innovative policies, and a shared vision of a more sustainable future (Mariani et al., 2022).

In summary, the relationship between disruptive sustainable innovations and grassroots innovations offers an analytical approach to guide the transition toward long-term sustainability. Analyzing this relationship of institutional, ecological, and social innovations with grassroots innovations this thesis shows the transformative potential of grassroots innovations to challenge norms, disrupt status quo systems, and catalyze transformative change.

2.4.1 Grassroots and institutional innovations

Institutional innovations involve changes made within established systems, organizations, or institutions that reshape the way they operate or deliver products and services (Geels., 2004; Tidd, & Bessant, 2020). These innovations can include changes in policies, regulations, organizational structures, and management practices (Hargrave & Van de Ven, 2006). Institutional innovations often occur as responses to changing circumstances, emerging challenges, or the need for increased efficiency and effectiveness (Ahlstrom et al., 2020). They can have top-down or other strategic directions to adapt or transform existing systems to meet evolving needs (Gifford et al., 2021). Examples of institutional innovations include the establishment of regulatory frameworks for emerging technologies, reforms in public education systems, and the creation of new government agencies to address specific issues (Fukuda-Parr et al., 2013; Sun et al., 2019).

The relationship between institutional innovations and grassroots initiatives is focused on in their joint efforts to create a governance landscape that favors sustainable outcomes (Seyfang et al., 2010; Hoppe et al., 2015). As innovations prompt institutional change, grassroots efforts provide bottom-up support and ensure these changes align with local contexts (Kezar 2012, Ward et al., 2015).

On one side, grassroots innovations can serve as catalysts for institutional innovations. When grassroots initiatives gain traction and demonstrate success, they can capture the attention of policymakers, organizations, and institutions (Cunningham, 2017). Indeed, Grassroots innovations can put pressure on established institutions to adapt and evolve bringing a disruptive change to the social context (Seyfang & Smith, 2007; Hossain, 2016; Hoicka et al., 2022). Successful grassroots innovations can provide real-world feedback that helps institutions refine and improve their

approaches (Geels et al., 2019). It can lead to the integration of these innovations into larger systems, resulting in institutional changes (Kiparsky et al., 2013).

On the other side, institutional innovations can create an environment that nurtures and supports grassroots innovations by providing frameworks, resources, and legitimacy (Smith & Raven, 2012). If institutions are slow to respond to disrupting emerging trends or changing needs, grassroots innovations can gain momentum and create demand for institutional reforms to accommodate these new approaches (Leeuwis et al., 2021).

Therefore, the relationship between grassroots innovators and institutional stakeholders can lead to hybrid models that combine the strengths of both approaches (Fressoli et al., 2014). For instance, established institutions can provide resources, scalability, and regulatory support to grassroots initiatives, while grassroots innovators can bring new perspectives for problem-solving methods to institution.

Additionally, successful grassroots innovations that prove their value require a reproduction or scaling-up to increase their impact. Institutional innovations can provide the infrastructure and support to reproduce or scale up them to reach a larger audience (Smith & Stirling, 2018).

In summary, grassroots innovations and institutional innovations are intertwined in a dynamic relationship where they can both inspire and influence each other, contributing to the evolution and progress of societies and of different sectors toward long-term sustainability.

2.4.2 Grassroots and eco-innovations

Eco-innovations, also known as environmental innovations or green innovations, refer to the development and application of new technologies, products, processes, or business models that have positive environmental impacts (Horbach et al., 2012). These innovations aim to reduce resource consumption, minimize pollution, improve energy efficiency, and contribute to sustainable development (Durán-Romero et al., 2020). Eco-innovations can occur at various levels, from individual products to industrial processes and policy changes (Carrillo-Hermosilla et al., 2010). Disruptive eco-innovations often introduce radical breakthroughs in sustainability, challenging existing production methods and consumption patterns. Grassroots innovations are related to disruptive eco-innovations since they push local communities to disrupt their way of managing natural resources through the adaptation eco-innovations to their specific contexts (Carrillo-Hermosilla et al., 2010; Hazarika & Zhang, 2019; Chistov, et al., 2023). These grassroots efforts contribute to the diffusion and adaptation of eco-innovations, thereby amplifying their impact on a decentralized scale (Pansera & Owen, R. 2014; Avelino, 2022; Eitan et al., 2023).

More specifically, on the one hand, grassroots innovations can play a significant role in generating eco-innovations (Pansera & Sarkar, 2016; Dudek & Wrzaszcz, 2020). Local communities and individuals often identify pressing environmental issues and come up with creative solutions to address them (Pastakia, 1998; Levänen et al., 2022). These solutions can then evolve into larger-scale eco-innovations that have a broader impact on the environment (Canwat, & Onakuse, 2022). Indeed, many eco-innovations begin as small-scale initiatives driven by grassroots innovators (Sarkar, S., & Pansera, 2017). These initiatives serve as testing grounds for new technologies, practices, or models (Fressoli et al., 2014). If they prove to be effective at the grassroots level, they can attract attention and be supported for further development and scaling-up (Solis-Navarrete et al., 2021).

On the other hand, Grassroots innovations can inspire the development of eco-innovations by showcasing innovative ways of approaching environmental problems (Kraus et al., 2017; Hansmeier, 2021). The success of grassroots initiatives can demonstrate the viability of certain approaches, motivating researchers, businesses, and policymakers to explore disruptive eco-innovation concepts on a larger scale (Vergragt et al., 2016).

Additionally, Grassroots innovator have a deep understanding of local environmental challenges and community needs. This contextual knowledge is crucial for developing eco-innovations that are effective and relevant within specific geographic, cultural, and socioeconomic contexts (Fastenrath & Braun 2018; Sovacool & Brisbois 2019).

Furthermore, eco-innovations with grassroots origins involve community engagement and participation (Buhl et al., 2016; Eitan et al., 2023). This involvement can foster a sense of ownership and increase the likelihood of successful implementation and long-term environmental sustainability (Stamm et al., 2017).

In summary, grassroots innovations and eco-innovations are correlated when grassroots initiatives can contribute to the development and advancement of disruptive eco-friendly solutions. These innovations collectively contribute to the goal of addressing environmental challenges and promoting sustainable practices.

2.4.3 Grassroots and social innovations

Social innovations are solutions or strategies designed to address social challenges, improve well-being, and enhance the overall quality of life for individuals and communities (Manzini et al., 2015). These innovations can occur at various levels, and they can be spurred by organizations, governments, and other institutional actors (Edwards-Schachter 2012; Morawska-Jancelewicz,

2022). Social innovations encompass a wide range of areas, such as education, healthcare, poverty alleviation, environmental sustainability, and more.

Their primary focus is on achieving positive social outcomes and fostering social change (Varadarajan & Kaul, 2018). Disruptive social innovations challenge prevailing social norms, fostering inclusivity, equality, and social cohesion (Angelidou & Psaltoglou, 2017). For this reason, the synergy between disruptive social innovations and grassroots initiatives is evident in their collective efforts to reshape social structures, promote equity, and empower marginalized communities (Hoppe & De Vries, 2018). Social innovations inspire grassroots efforts, while grassroots initiatives provide real-world testing grounds for these innovations (Chen, et al., 2020). More specifically, most of the grassroots innovations fall under the category of social innovations, as they address societal challenges and aim to create positive social impact from a sustainable point of view (Grimm et al., 2013). These grassroots initiatives often contribute to the broader field of social innovation by introducing new models, practices, and approaches that can be adopted and scaled by larger organizations or institutions (Westley et al., 2014; Kar et al., 2019).

Additionally, the creativity, and effectiveness demonstrated by grassroots initiatives can encourage institutions and organizations to explore similar approaches to address social issues (Wu & Si, 2018). Indeed, as said before, grassroots innovations often serve as testing grounds for new ideas and concepts. If these innovations prove to be successful in addressing local problems and generating positive outcomes, they can attract attention from social entrepreneurs, NGOs, and other stakeholders who may seek to adapt and scale them to have a broader societal impact (Mulgan, 2006; Ellis, 2010; Santos, 2012). Therefore, Grassroots innovations can provide valuable feedback to social innovators and organizations by showcasing real-world challenges and opportunities. This feedback allows to improve social innovation strategies and approaches (Van Wijk et al., 2019).

In summary, grassroots innovations and social innovations share a symbiotic relationship since grassroots initiatives can serve as important drivers of social change and inspire larger-scale, more organized efforts to address societal challenges.

2.5 Summary

This chapter provided an overview of the theoretical landscape of grassroots innovations and circular societies, identifying key innovative forms that support this type of society and outlining the key economic principles. The justification of the analytical framework will be given in the following chapter. In the third chapter, I will expand the relationship between a Circular Society and grassroots innovations, and I will propose a new sustainable societal model.

The analytical framework

Chapter Three

3.1 Introduction

The previous chapter provided an overview of the theoretical landscape of the Circular Society by identifying the relationship between grassroots innovations and ecological economics, Degrowth, the Circular Society, sustainable innovations.

Instead, this chapter provides a rationale for the choice of analytical framework of this thesis. An overview of the Jaeger-Erben (2020) lens is provided and q new model of the Circular Society supported by grassroots innovations is proposed.

3.2 General overview

The concepts of Circular Economy and Circular Society want to create more sustainable economic systems that minimize waste and resource depletion (Korhonen et al., 2018). However, there are some key differences between the two concepts.

First, economic focus vs. social well-being.

On the one hand, the classical circular economy has primarily an economic focus with the goal of redesigning production and consumption systems to reduce waste to reduce production costs (Ghisellini et al, 2016). This model emphasizes the efficient use of natural resources and aims to minimize negative environmental impacts (Mavi & Mavi, 2019).

On the other hand, the Circular Society concept expands the focus beyond economic considerations. It proposes that economic activities should serve the well-being of society within the planetary boundaries (Raworth, 2017; Jaeger-Erben et al., 2021. Therefore, the Circular Society concept wants to propose a more inclusive and solidary society that considers not only economic progress but also social and environmental well-being (Leipold, et al., 2021).

Second, the classical circular economy concept measures success based on monetary value creation and economic growth (Winans et al., 2017). It aims to reduce waste and resource use in a way that our society can maintains or increases economic prosperity.

In contrast, the Circular Society introduces the idea of multi-dimensional progress measures. This means considering a broader range of factors beyond just economic value, including social and ecological dimensions (Jaeger-Erben et al., 2020; Melles 2021).

Third, the circular economy wants to address environmental issues such as resource depletion and waste management. It proposes innovative business models to tackle these challenges (Freund et al, 2019).

Instead, the Circular Society, goes further by highlighting social equity and justice (Svenfelt et al., 2019). It emphasizes the need for solidarity, inclusiveness, and balanced social relationships within the context of sustainable economic practices (Jaeger-Erben et al., 2020).

Forth, circular economy focuses on technical solutions such as circular product design, recycling, and efficient resource use. It wants to improve industrial production to minimize environmental impacts and increase economic profitability (Ghisellini et al., 2016).

Instead, the Circular Society suggests that to achieve a sustainable society is necessary a more profound societal transformation. Indeed, this model proposes changes in social norms, values, and practices encouraging collaboration, and participatory decision-making (Jaeger-Erben et al., 2020)

Finally, the circular economy focuses on innovations that arise within the market (Rizos et al., 2016).

Instead, The Circular Society places importance on circular literacy (Jaeger-Erben et al., 2020). Circular literacy focuses on holistic thinking, complexity, and on the innovation capabilities that can arise in any social context (therefore also outside of the market) to resolve social complexities in specific territories for a transition towards a resilient and sustainable society (Jaeger-Erben et al., 2020).

In summary, while the classical circular economy focuses on resource efficiency and waste reduction from an economic purpose, the concept of Circular Society takes a more holistic approach by incorporating social, ecological, economic, and cultural dimensions (see figure 2).

The main objective of the Circular Society is to transform our economic system to put it at the service of social and environmental well-being.

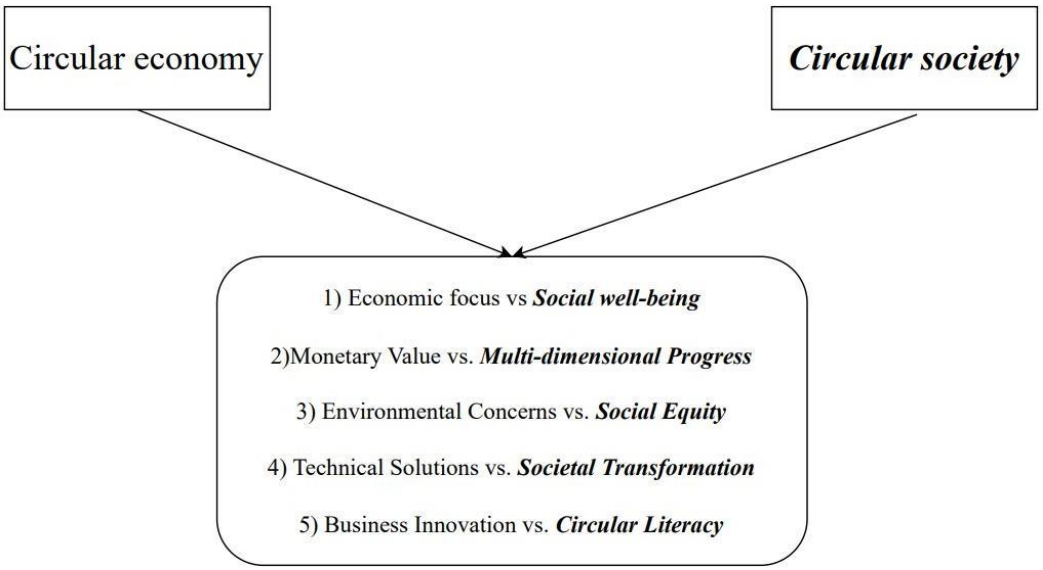

Figure 2: Circular economy vs Circular Society

3.3 The Jaeger-Erben lens: Political economy of Circular Society

The Circular Society, according to Jaeger-Erben (2020), has specific characteristics (see figure 3). First, this framework discusses the relevance of the circular economy model in addressing the problems caused by our economic system such as resource exploitation. As stated by Jaeger-Erben et al. (2020), the focus of the circular economy on monetary value and economic progress needs to be extended to include broader societal well-being.

Second, according to Jaeger-Erben modern societies have to evolve from self-destructive metabolic systems that damage both the environment and social well-being. The Circular Society integrating ecological, social, and economic dimensions within planetary boundaries will overcome these societal limitations creating both social and environmental benefits (Jaeger-Erben et al. 2020).

Third, the Circular Society aims to bring large-scale change within the entire social context by promoting a participatory, communitarian, solidarity consumption and production system (Jaeger-Erben et al. 2020). This model integrates economic, social, and environmental sustainability, promoting resilient, accessible, transparent, and democratic practices. Furthermore, according to the Circular Society's model, the political economy should be inclusive and participatory, providing space for collaborative, community-based and multi-stakeholder processes where communities play a first-order role in defining policies and creating innovative processes.

Forth, the main purpose of this model is to balance the biosphere, technosphere, and sociosphere through creative and experimental processes (Jaeger-Erben et al. 2020).

Finally, this model enhances the transformative capabilities (Jaeger-Erben et al. 2020).

For creating a Circular Society model is necessary to enhance transformative capabilities and Circular Literacy. Circular Literacy means that all citizens and communities involved within the Circular Society have to understand and respect natural cycles, have apply systemic thinking, and have to be able to manage complexity.

For these reasons, the Circular Society emphasizes the need for a profound shift in economic paradigms toward circular, sustainable systems underlining the importance of a multidimensional approach that considers ecological, social, and economic factors to create a more resilient society (Jaeger-Erben et al. 2020).

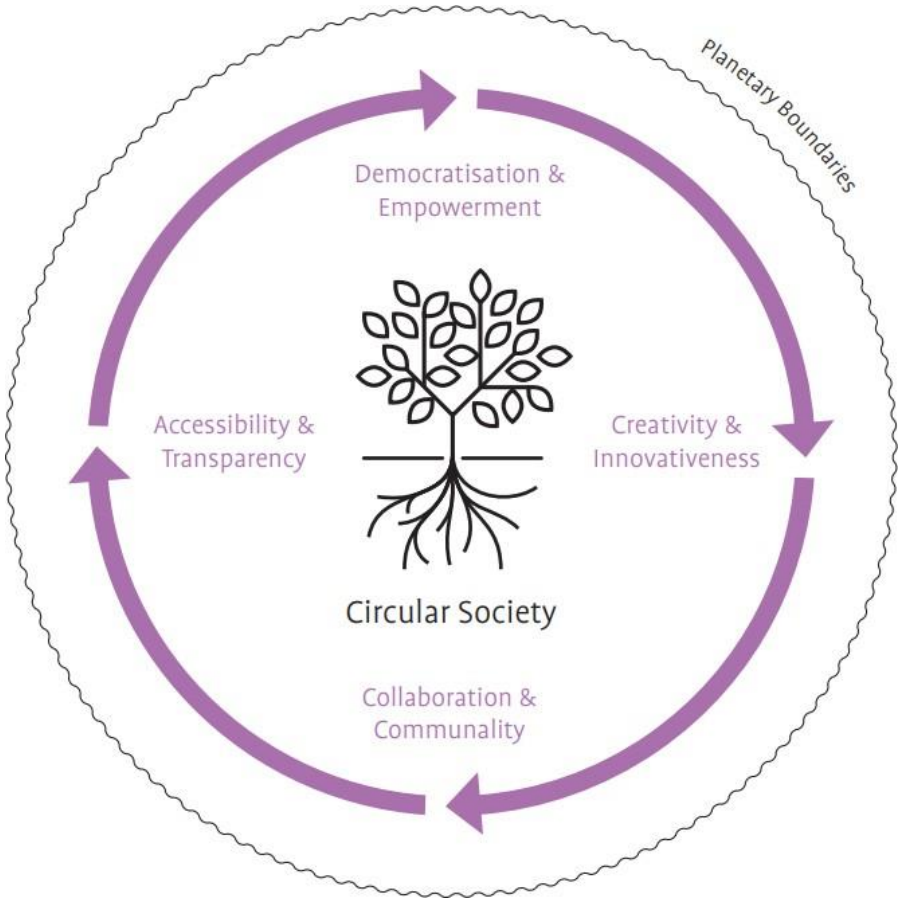

Figure 3: Jaeger-Erben Lens (2020)

3.3.1 Accessibility and transparency

the concepts of accessibility and transparency contribute to the vision of the Circular Society. These concepts emphasize the need to provide equal opportunities for participation, engagement, and access to resources, information, and decision-making processes **(**Jaeger-Erben et al., 2020; Jaeger-Erben et al., 2021).

More specifically, accessibility refers to the principle of ensuring that essential resources, services, and opportunities are available to all members of society, regardless of their background, socioeconomic status, or other factors. In the context of the Circular Society, accessibility is extended to various dimensions including equitable access to natural resources, land, housing, clean water, energy, and other essential materials. In the Circular Society, policymakers have to create the preconditions to prevent the monopolization or unequal distribution of resources, ensuring that everyone can benefit from and contribute to sustainable practices (Hermann et al., 2022).

Additionally, the concept of Accessibility includes education and health services. People should have equal access to quality education and healthcare, enabling them to participate fully in economic, social, and cultural activities (Calisto et al., 2023).
Furthermore, a Circular Society aims to provide opportunities for all citizens to engage in economic activities, whether through employment, entrepreneurship, and collaborative initiatives (Jensen et al., 2023).
Finally, the accessibility also includes access to technological advances and innovative processes. Indeed, the Circular Society encourages the use of technology by all stakeholders to improve sustainability and well-being (Milios, 2022).
Transparency is a principle that emphasizes openness, clarity, and the availability of information. In the context of the Circular Society, transparency plays a central role in fostering trust, accountability, and decision-making processes **(**Jaeger-Erben et al., 2020; Jaeger-Erben et al., 2021).
More specifically, transparent practices include information sharing about the entire lifecycle of products and services, including their sourcing, production processes, environmental impacts, and end-of-life. This allows consumers to make informed choices and encourages them to create or adopt businesses and responsible practices (Echefaj et al., 2023).
Additionally, transparency is also applied to decision-making processes within economic, social, and governance structures. It includes making information about policies, regulations, and decisions accessible to the public by increasing public participation (Clube & Tennant, 2023).
Finally, Transparency ensures that organizations and individuals are accountable for their actions. This accountability includes environmental, social, and ethical considerations, promoting responsible behavior (Spekkink et al., 2022).
In summary, accessibility and transparency ensure equal access to resources, equal opportunities and equal responsibility fostering transparent practices that contribute to a more inclusive and sustainable society that promotes social well-being and environmental protection.

3.3.2 Democratization and empowerment

The concepts of democratization and empowerment are fundamental principles that emphasize participatory decision-making, equal representation, and the enhancement of individuals' capabilities within the Circular Society **(**Jaeger-Erben et al., 2020; Jaeger-Erben et al., 2021).
Democratization refers to the process of making economic, social, and political systems more democratic and inclusive. In the context of the Circular Society, democratization shifts power and

decision-making from a few to a broader range of stakeholders **(**Jaeger-Erben et al., 2020).
It could be at various levels, from local economic initiatives to national policies. Indeed, the concept of democratization promotes inclusiveness since the aim of the Circular Society is to include marginalized groups, underrepresented communities, and individuals of all backgrounds to represent the needs of all the stakeholders (Calisto Friant et al., 2023)
Additionally, the concept of democratization promotes decentralization. The decentralization wants to distribute decision-making to various levels and entities. In the context of the Circular Society, it means giving to local communities more control over economic practices and resource management, allowing for solutions that are context specific (Jensen et al., 2022).
Furthermore, democratization wants to promote participatory governance by extending governance structures. It means creating spaces for citizens, workers, consumers, and other stakeholders where they can express their opinions regarding the rules, regulations, and policies that govern economic activities (Nogueira & Wallig, 2022).
Empowerment refers to the process of favoring individuals and communities to gain control over their lives, make informed choices, and take action to improve their situation **(**Jaeger-Erben et al., 2020).
Within the Circular Society framework, empowerment is a core principle that includes different elements.
First, as said before, the empowerment to give the possibility to citizens and communities to have access to information, education, and knowledge. For this reason, Individuals can understand the implications of their choices and actions, in terms of sustainable consumption, production, and resource management (Clube & Tennant, 2023).
Second, empowerment means providing individuals with the skills and capabilities needed to actively participate in economic, social, and environmental activities. It includes training in sustainable practices, entrepreneurship, and community collaboration.
Third, empowerment fosters a sense of self-efficacy, increasing the confidence of individuals and communities regarding their ability to bring a positive impact and influence their environment. This confidence encourages proactive engagement in sustainable initiatives.
Forth, Empowerment ensures that individuals' voices are heard and respected in decision-making processes. This model recognizes that diverse perspectives contribute to better solutions (Scuotto et al., 2023).
Finally, empowerment means promoting equity and social justice. The empowerment of marginalized and vulnerable groups ensures that every stakeholder has a role in the Circular Society (Kirchherr et al., 2023).

In summary, the concepts of democratization and empowerment prioritize active participation, equal representation, transparency, and the enhancement of individuals' capabilities. By democratizing decision-making processes and empowering individuals and communities, the Circular Society aims to create a more inclusive and sustainable society.

3.3.3 Collaboration and Communality

The concepts of Collaboration and Communality foster cooperative and collective approaches to economic activities and resource management. These concepts emphasize that it is essential a multi-stakeholder engagement to achieve sustainable and inclusive outcomes **(**Jaeger-Erben et al., 2020; Jaeger-Erben et al., 2021).

Collaborations favor collaborative partnerships between businesses, governments, civil society organizations, and communities. These partnerships leverage each stakeholder's strengths and resources to achieve common goals.

First, in the context of the Circular Society, collaboration is a key principle that drives the transition toward a more sustainable economic system. Indeed, Collaborative practices are driven by shared objectives that go beyond individual or organizational interests (Konno & Schillaci, 2021). In the Circular Society, these shared objectives focus on sustainability, resource efficiency, and social well-being.

Second, collaborative efforts bring together experts from different disciplines, industries, and sectors. The Circular Society encourages cross-disciplinary collaboration to address complex challenges (Sonnier & Grit, 2022).

Third, collaboration favors co-creating solutions and initiatives. It includes joint design of products, services, and policies that integrate different perspectives and expertise (Del Giudice et al., 2022).

Fourth, collaboration fosters the birth of new innovative forms. Innovative forms born from the collaboration of different stakeholders can provide creative solutions suitable for a specific context Del Giudice et al., 2023).

Fifth, collaboration promotes knowledge and best practices sharing. In the context of the Circular Society, knowledge sharing is essential for adopting, reproducing, or scaling up sustainable practices (Bocken & Short 2021).

Communality refers to the sense of community, shared identity, and mutual support that arises when individuals come together around common interests and values **(**Jaeger-Erben et al., 2020).

In the Circular Society, the concept of commonality plays a significant role in shaping economic social and economic practices.

More specifically, in the Circular Society, individuals and communities identify themselves as part of larger collective networks for implementing sustainable economic practices. This collective identity fosters a sense of responsibility for the well-being of the community and our planet (Villalba-Eguiluz et al., 2023).

Furthermore, communality favor caring for and protecting shared resources. In the Circular Society, the different stakeholders (including the citizens and the communities) are responsible for natural resources management, waste reduction, and promoting the circular use of materials van Bueren et al, 2023).

Finally, communality strengthens social bonds and cohesion of communities. Strong social relationships facilitate collaboration, communication, and joint actions. The principle of communality manifests in the form of local initiatives, such as community gardens, cooperatives, and sharing networks. These initiatives create spaces for collaboration and shared benefits (Chavez-Miguel et al., 2022.

In summary, collaboration and communality promote the involvement of multiple stakeholders, the sharing of resources and the promotion of a sense of shared responsibility in creating sustainable economic practices. By encouraging collaboration and strengthening community bonds, the Circular Society aims to create a more connected, inclusive, and environmentally conscious society.

3.3.4 Social innovativeness and creativity

The concepts of social Innovativeness and creativity highlight the importance of generating innovative ideas, solutions, and approaches to address social and environmental challenges. These concepts emphasize the role of social innovations and creativity in driving positive change **(**Jaeger-Erben et al., 2020; Jaeger-Erben et al., 2021).

Social innovativeness refers to the ability and willingness of individuals, communities, organizations, and societies to develop and implement innovative ideas and solutions that address specific social and environmental issues. In the context of the Circular Society, social innovativeness plays a crucial role in transforming economic practices toward sustainability **(**Jaeger-Erben et al., 2020).

More specifically, social innovativeness allows you to implement a problem-solving approach by recognizing the need to adopt innovative solutions to address complex challenges, such as resource depletion, waste production and social inequality (Sonnier & Grit, 2022).

Additionally, social innovativeness encourages creative thinking and the exploration of unconventional approaches. It challenges existing norms and paradigms to find more efficient, equitable, and sustainable ways of conducting economic activities. Indeed, social innovators are

adaptable and responsive to changing circumstances (Villalba-Eguiluz et al. 2023). They are open to learning from failures and successes adjusting their strategies to achieve positive outcomes.
Moreover, social innovativeness grows in collaborative environments where diverse stakeholders contribute with expertise and different perspectives (van Bueren et al., 2023).
Finally, Social innovators consider the interconnectedness of social, economic, and environmental factors. For this reason, innovators adopt systems thinking strategies to identify key leverage points for positive change trying to avoid unintended consequences for the social system (Hermann et al., 2022).
Creativity refers to the ability to generate innovative ideas, solutions, and concepts. In the context of the Circular Society, creativity is essential for reimagining economic practices, products, and services to prioritize sustainability and social well-being **(**Jaeger-Erben et al., 2020).
More specifically, creativity favors original and innovative ideas that challenge conventional thinking. Creative individuals are willing to explore new perspectives and take risks (Spekkink et al., 2022).
Moreover, creativity often emerges at the intersection of different fields and disciplines. For this reason, it is necessary to bring insights from various areas of knowledge and from different stakeholders to create innovative solutions (Jensen et al., 2022).
Furthermore, creativity requires a strong imagination and the ability to envision possibilities that have not yet been realized. Visionary thinking drives the creation of transformative and disruptive innovations (Scuotto et al., 2023).
Finally, Creative individuals are adaptable and open to exploring diverse approaches. They recognize that there are multiple ways to solve societal problems and are willing to experiment with different strategies (Del Giudice et al., 2023).
In summary, the concepts of social Innovativeness and creativity encourage individuals and communities to think creatively, develop innovative solutions, and creatively reimagine economic practices to align with sustainability goals. By fostering social innovativeness and creativity, the Circular Society aims to drive positive change, overcome challenges, and create a more resilient and environmentally conscious society.

3.3 Creating a Model Circular Society: Cities, Ecosystems, and main Productive sectors.

The model of a Circular Society described that integrates the principles of accessibility and transparency, democratization and empowerment, collaboration and communality, social Innovativeness and creativity needs specific grassroots innovation to be implemented (Jaeger-Erben et al. 2020; Medina-García et al., 2021) (see figure 4). Indeed, as explained grassroots innovations embody the articulated principles of the Circular Society and its distinctive characteristics.

The Circular Society is based on three a of three levels: the City Level (Transition cities), the Entrepreneurial Ecosystem level, and the Main Productive Sectors and innovative forms (Energy Communities, Solidarity Purchase Groups, Fab labs, and communitarian waste Management) necessary to build this type of society.

First, transition cities are a specific city model (with a grassroots perspective) which follows the principles of the Circular Society. Transition cities are local communities that aim to make a transition from a fossil fuel-dependent economy to a sustainable and resilient economy.

From the accessibility and transparency point of view, transition cities prioritize open access to information, ensuring that residents have clear insights of the city's sustainable initiatives, policies, and resources. Information about waste management, energy consumption, and sustainable practices is easily accessible to every stakeholder.

From the democratization and empowerment point of view, residents actively participate in decision-making processes of their city. Participatory budgeting and citizen assemblies empower individuals to shape the city's sustainability initiatives and allocate resources in accordance with all stakeholders.

From the collaboration and communality point of view, Transition cities foster strong community relationships through collaborative projects. Community gardens, shared spaces, and fab labs encourage collaboration, resource sharing, and a sense of communality.

Finally, from the Social Innovativeness and Creativity point of view, transition cities residents are encouraged to propose innovative solutions to urban challenges. Community-led initiatives, such as urban farming and renewable energy cooperatives, drive social innovation and city creativity.

Second, Grassroots Entrepreneurial Ecosystems put at their center the collaboration of NGOs, community groups, and local businesses to drive sustainable economic activities aligning at the principles of the Circular Society.

Indeed, from an accessibility and transparency point of view, Grassroots Entrepreneurial ecosystems allow all stakeholders to use information new technologies to create innovative processes.

From the democratization and empowerment point of view, local NGOs and community groups play a significant role in supporting and empowering social entrepreneurs. Indeed, these organizations provide training, mentorship, and resources to individuals looking to start grassroots activities.

From the collaboration and communality point of view, entrepreneurs collaborate with NGOs and community groups to develop solutions that benefit both the environment and the local community. This collaboration fosters a sense of communality and responsibility between different stakeholders. Finally, from a Social Innovativeness and Creativity point of view, in Grassroots entrepreneurial ecosystems entrepreneurs, NGOs, institutions, and community groups continuously innovate to address sustainability challenges. They create products and services that align with circular economy principles, such as upcycled products, low-carbon energy, repair services, zero-kilometer vegetarian food, and zero-waste packaging.

Third, the Circular Society model integrates key productive sectors that drive long-term sustainability. This model integrates local renewable energy communities that promote clean energy generation, distribution, and consumption. Residents collaborate to create renewable energy projects sharing resource for reduce energy costs and waste.

Moreover, the Circular Society favors the birth of Solidarity Purchase Groups where consumers collaborate with producers toward voluntary work and buying zero-kilometer food to reduce the price of the products, reducing packaging waste and promoting local and sustainable products.

Additionally, the Circular Society promotes the use of fab labs. Fab labs are community workshops equipped with tools for digital fabrication. They enable individuals to create, repair, and share products, reducing the need for resource-intensive manufacturing processes.

Finally, the Circular Society promotes multi-stakeholder models of waste management. Artificial intelligence is used to create transparent and traceable waste management and traceability systems in which citizens, businesses and authorities collaborate to increase the recycling of materials by transforming a large part of waste from a cost to a resource for institutional and non-institutional stakeholders.

In this social model, grassroots innovations allow the birth of a society where communities are actively involved, empowering, and integrating all stakeholders to create a resilient and sustainable society.

Indeed, Grassroots innovations play a crucial role in the context of the concepts discussed in the Circular Society theory.

Accessibility and Transparency: Grassroots innovations originate at the local level, addressing specific needs and challenges within communities. These innovations are inherently transparent, as they emerge from the bottom-up and are often developed collaboratively with community members. The open sharing of information and ideas aligns with the principles of accessibility and transparency, ensuring that knowledge and solutions are accessible to all for a wispread well-being (Seyfang & Smith, 2007).

Democratization and Empowerment: Grassroots innovations embody the principles of democratization by decentralizing decision-making processes. Local communities are empowered to identify and address their unique challenges, promoting inclusivity and representing the diverse needs of stakeholders. Grassroots innovations empower individuals giving a central role to communities that take control of economic practices and resource management, aligning with the democratization and empowerment aspects of the Circular Society (Smith & Stirling, 2018).
Collaboration and Communality: Grassroots innovations often thrive on collaboration and communality. Local initiatives, such as community gardens, cooperatives, and sharing networks, are forms of grassroots collaboration. These initiatives strengthen social bonds, foster a sense of community, and encourage shared responsibility for sustainable economic practices. Grassroots innovations exemplify the multi-stakeholder engagement advocated by the concepts of collaboration and community in the Circular Society Hossain, M. (2018).
Social Innovativeness and Creativity**:** Grassroots innovations are inherently social and creative responses to challenges. They showcase the social innovativeness of communities in addressing specific social and environmental issues at the local level. Grassroots initiatives often involve creative thinking, unconventional approaches, and the exploration of innovative solutions, aligning with the concepts of social innovativeness and creativity in the Circular Society to solve enviromental and social problems (Belda-Miquel et al., 2020).
To conclude, in this section, it has been explained in detail how grassroots innovations integrate and precisely reflect the values of the Circular society. More specifically, it delves into which city model aligns more closely with the principles of the Circular Society which entrepreneurial ecosystem is more suitable for supporting this type of society and what are the innovations that support this model. For this reason, this thesis contributes to the literature by providing a detailed explanation of the preconditions and support innovations needed to realize this type of societal element, which has not been described in previous scientific research.

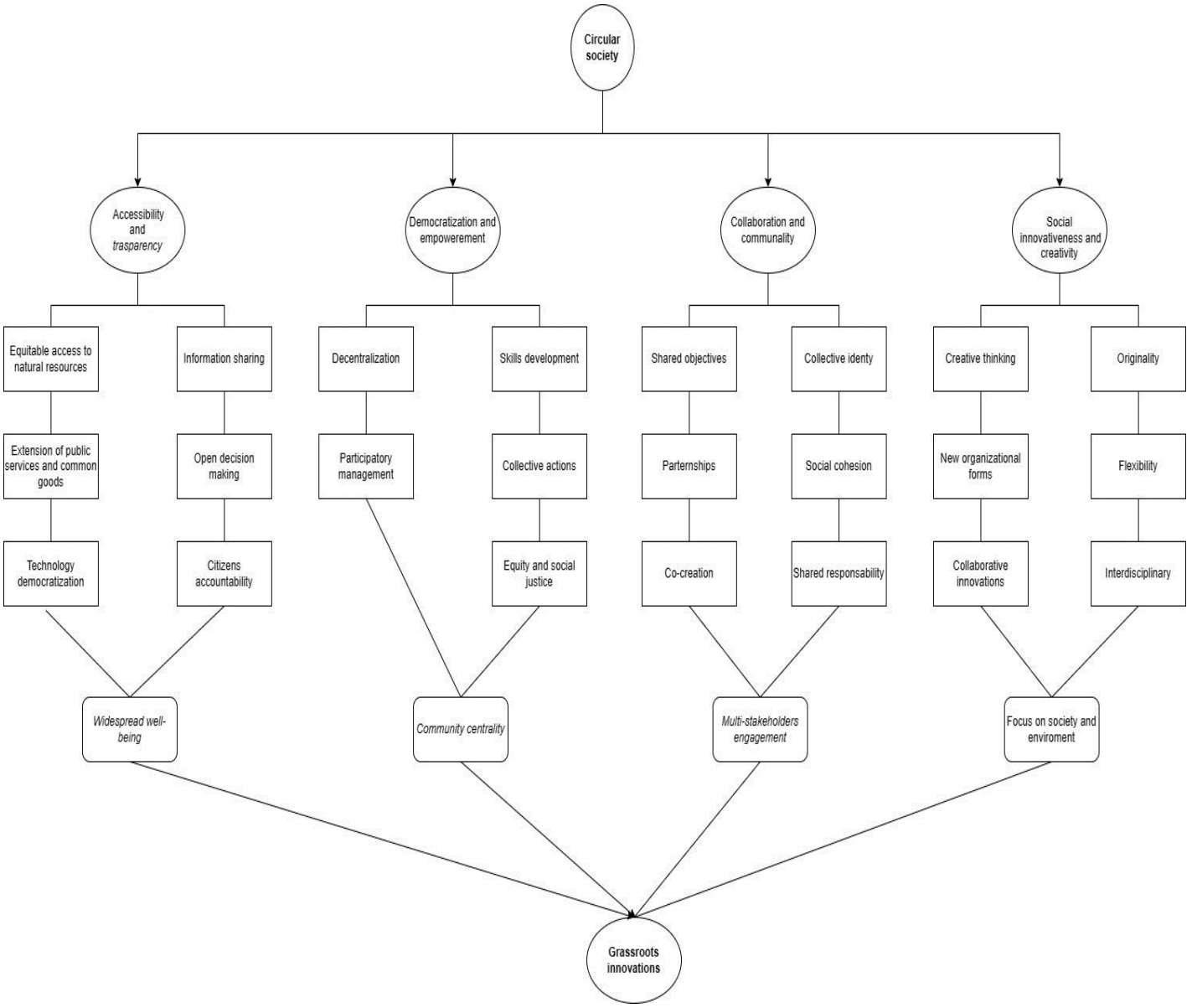

Figure 4: The Circular Society model

3.4 Summary

This chapter explained in detail why was chosen this specific analytical framework for this thesis. An overview of Marie Jaeger-Erben's lens has been provided showing how it relates to the studies that will be presented in the following chapter.

More specifically, a new model of society has been proposed that integrates new principles to create a society that can achieve long-term sustainability through the implementation of bottom-up

innovative processes (grassroots innovations) that align with the principles of ecological economics. The following chapter articulates the research path of this thesis and provides a breakdown of the publications following the tripartite division of sustainable innovations by analyzing all three subcategories according to the bottom-up innovation perspective. Furthermore, this chapter will illustrate the theoretical connections between the various articles that will be presented.

Articulation of the research journey
Chapter Four

4.1 Introduction

This chapter provides a comprehensive rationale for the selection of the specific analytical framework used in this thesis. Indeed, this chapter offers an in-depth exploration of the concept of Circular Society, as defined by the Jaeger-Erben Lens, through numerous studies. In particular, the first two papers clarify the essential social structures for a city to develop a bottom-up entrepreneurial ecosystem, thus enabling the birth of the Circular Society.
Subsequently, this chapter explores the organizational models and innovative processes necessary for the birth of the Circular Society. More specifically, this chapter explores the thesis research according to a funnel logic, according to the three subcategories of sustainable innovations: the institutional perspective, the eco-innovation perspective, and the social innovations perspective. This structure ensures a comprehensive exploration of the grassroots innovations for implementing the Circular Society.
Finally, the connections and synergies between the various papers are clarified through an introductory part for each section.

4.2 Grassroots Institutional Innovations Perspective

The concept of grassroots institutional innovations presents a transformative perspective on sustainable development within the framework of a Circular Society (Seyfang & Haxeltine, 2012). This perspective challenges conventional top-down approaches to governance and economic values. Rooted in the principles of inclusiveness, collaboration, and multi-dimensional progress, grassroots institutional innovations open the way for disruptive changes that can reshape our society (Temper, et al., 2018). Fundamentally, the grassroots institutional innovations perspective envisions a shift towards active citizen engagement in decision-making processes (Irvin & Stansbury, 2004). Transition cities, for instance, represent an optimal example of this perspective. These cities, driven by community-led projects, advocate for self-production and multi-stakeholders resource management, challenging centralized governance (Campos & Marín-González, 2020). This

decentralization of resource management disrupts established models and empowers citizens to play a leading role in shaping sustainable communities (Schreuder & Horlings, 2022).
Additionally, this perspective is based on the interplay between grassroots innovations and entrepreneurial ecosystems. Grassroots innovations, emerging from civil society, challenge the concept that innovation is solely driven by businesses and institutions (Żuk, P., & Żuk, 2022). These innovations redefine economic growth as a collaborative endeavor, where citizens contribute directly to local development. By integrating entrepreneurial ecosystem thinking with grassroots innovation, this perspective opens doors to a more inclusive and diverse innovation landscape (Growth et al., 2015). Furthermore, the grassroots institutional innovations perspective introduces the concept of alternative economic models toward the challenge of sustainability. Indeed, it challenges the status quo of the market economy and sustainable development by emphasizing the importance of shared knowledge, culture, and support systems in fostering innovation (Kump & Fikar, 2021). It leads to a reimagining of economic development, where local needs and sustainability take precedence over growth objectives. This perspective highlights the potential of collaborative governance to create a Circular Society, where citizens, policymakers, and stakeholders work together to drive innovation and inclusion (Iaione, 2016).
In conclusion, the grassroots institutional innovations perspective disrupts traditional notions of governance, economics, and development by placing citizens at the forefront of transformative change. By fostering collaboration, inclusiveness, and multi-dimensional progress, this perspective sets the stage for a more sustainable and resilient future within the context of a Circular Society.

4.2.1 Paper uno: Cities

Title

Systems thinking for Sustainable Cities: A conceptual model to analyze Transition Cities (Proceeding paper no publication yet).

Key themes

Systems thinking, Grassroots movements, Transition cities, Sustainable cities, multi-stakeholder analysis

Key outputs

This research paper proposes a conceptual model for transition cities, which are sustainable cities based on grassroots community projects. The model aims to increase the self-production and management of basic needs such as energy, food, water, and waste, reducing the impact of economic instability, peak oil, and climate change by empowering citizens and communities in natural resource management and creation of economic activities from below (see table 4). Indeed, the transition city model requires strong social cohesion and cooperation among citizens, local institutions, and other stakeholders.

Area of application	Transition city Main Activities
Buildings and housing	Eco-construction Cohousing
Education	Transition local schools Workshops about future scenarios
Food	Shared garden Seeds and plant swaps Allotments association
Energy and Grid	Renewable energy supply companies Energy communities Microgrid systems
Water	Systems to collect rainwater
Waste	Food recycling Makerspaces Recycling workshops
Health and wellbeing	Complementary health practitioners Discussion groups on national health service
Economics and livelihoods	Sustainable business park Sharing economy markets
Local government	Decentralized control of the commons Multi-stakeholder management

Table 4: Main activities of transition cities

(Brunetta & Baglione 2013;Connors & McDonald, 2011)

Since there is a lack of studies analyzing this model from a governance and management perspective, this paper proposes systems thinking and multi-stakeholder analysis as a conceptual model that helps stakeholders in the creation and management of transition cities (see figure 5). The model consists of five key sections: selecting participants, understanding, and framing the

problem, mapping the model using a Causal Loop Diagram, identifying key leverage points, and implementing intervention strategies for city transformation.

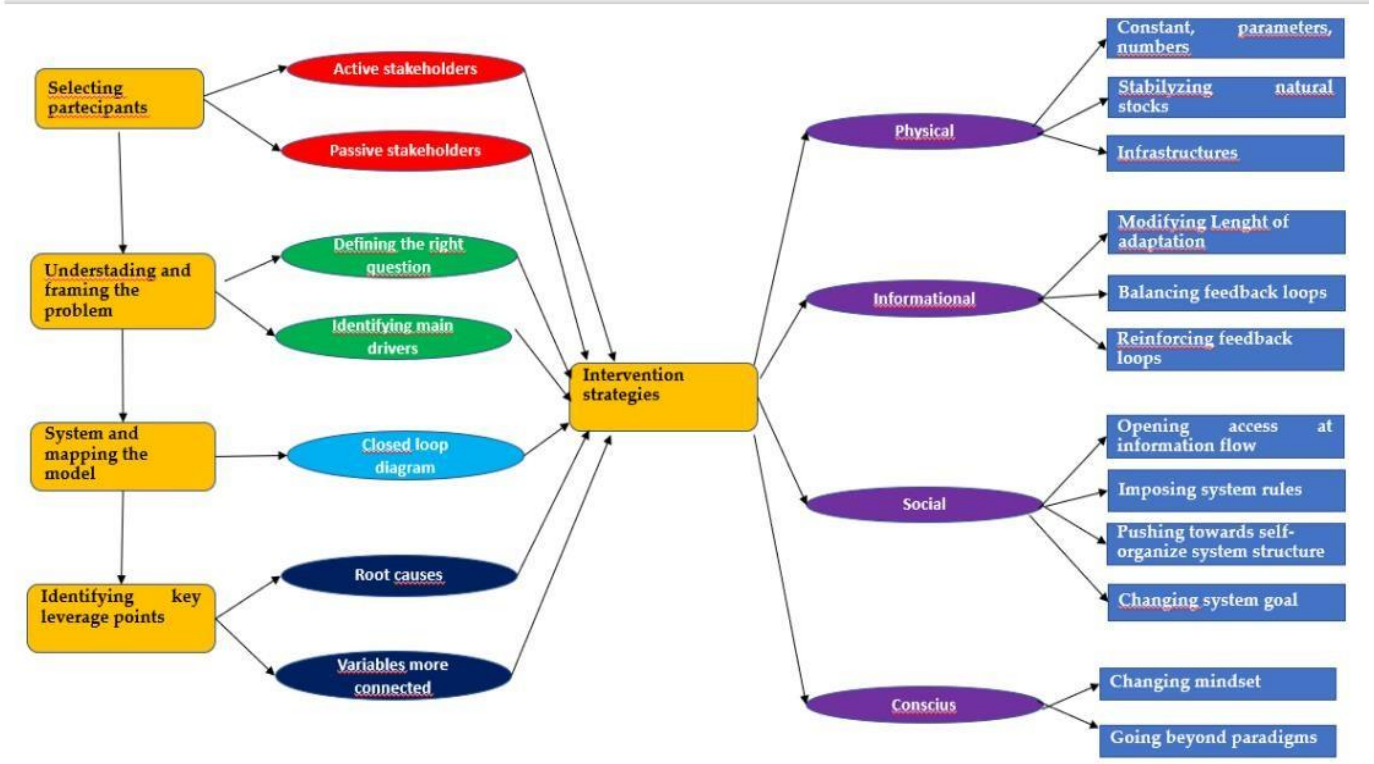

Figure 5: Overview of the Multi-stakeholder/ systems thinking analysis
(Own elaboration)

The main aim of this paper is to foster collaboration between policymakers, citizens, and other stakeholders to promote a city model that follows the principles of the Circular Society
From the theoretical point of view, this paper enhances the understanding of multi-stakeholder governance for sustainability and the role of active citizens in decision-making contributing to the fields of grassroots innovations, sustainability and multi-stakholder governance. Additionally, it highlights the need for alternative approaches to sustainability beyond technocratic and apolitical perspectives contributing to the fields of ecological economics and Degrowth.
The managerial implications emphasize the importance of involving new stakeholders in transition toward transition cities, such as local governments, businesses, and communities, to foster innovation and inclusion. Indeed, this paper suggests that transition cities can benefit from an open innovation participatory ecosystem approach.
For these reasons, this paper serves as an introduction to the subsequent papers.
First, it shows that it is necessary to change the relationship between institutions and other

stakeholders if we want to create a specific ecosystem for implementing the Circular Society (paper 2).

Second, this paper demonstrate that it is necessary to implement projects and new organizational and innovative forms that seek to reduce environmental impacts (paper from, 3 to 7) and to improve social cohesion (Paper from 8 to 10).
However, the study has two main limitations.
First, it is only a conceptual paper and lacks quantitative or qualitative analysis. Further research should analyze multiple case studies to evaluate the costs and benefits of implementing the transition city model.
Second, future researchers should examine the relationship between environmental sustainability, urban management, economic growth, and social well-being inside transition cities since it has not been explored in this paper.

4.2.2 Paper two: Ecosystems

Title

Exploring Grassroots Innovation for Sustainable Development in Entrepreneurial Ecosystems

Key themes

Systems thinking, Grassroots movements, Transition cities, Sustainable cities, multi-stakeholder analysis

Key outputs

This chapter addresses the concept of grassroots innovations (GIs) and their relationship with entrepreneurial ecosystems in the context of a Circular Society. GIs are social innovations that emerge from civil society, driven by the aim to achieve long-term sustainability. They represent a bottom-up approach to addressing social, economic, and environmental challenges, with citizens actively participating in the creation and implementation of innovative solutions.
This chapter highlights the limited research on GIs from an entrepreneurial and managerial perspective, emphasizing the need to bridge this gap. To fill this research void, this book chapter proposes a conceptual framework that integrates the entrepreneurial ecosystem perspective with a grassroots lens. This framework aims to provide a holistic analysis of GIs, considering various stakeholders and ecosystem characteristics such as policymakers, active citizenship, institutions, workers, social culture, and shared knowledge.

Hence, this study offers a detailed literature review on grassroots innovations and the entrepreneurship ecosystem, providing a comprehensive understanding of the subject matter. By examining existing research, the authors identify key themes and clusters of keywords associated with GIs, including actors and characteristics of grassroots innovations, grassroots movements, their contribution to the economy, and their role in sustainable development (see figure 6).

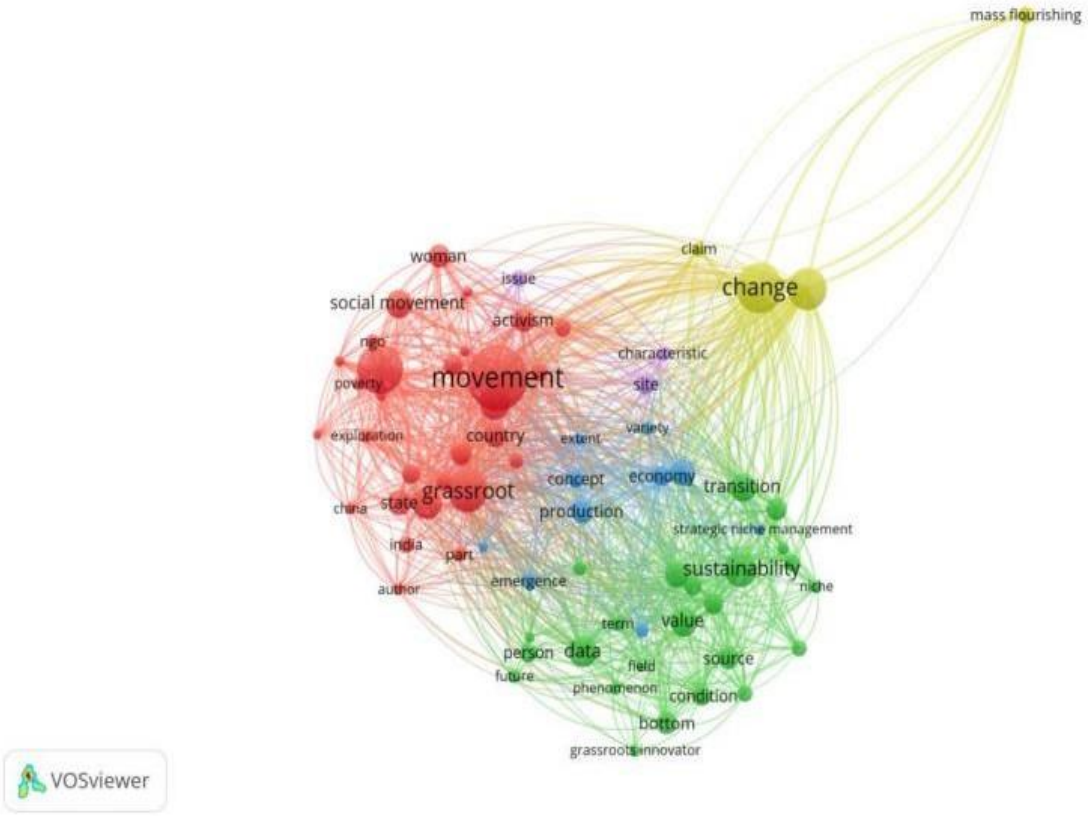

Figure 6: Clusters of keywords used by the reviewed literature on grassroots innovations (Authors elaboration)

Furthermore, this chapter presents a conceptual model based on the framework proposed by Isenberg (2011) for analyzing entrepreneurial ecosystems. The authors adapt this model to the context of grassroots entrepreneurship, incorporating the unique features and considerations of GIs. The model underscores the importance of policy, finance, culture, support systems, human capital, and markets in fostering the reproduction or scaling-up of GIs for sustainability (see figure 7).

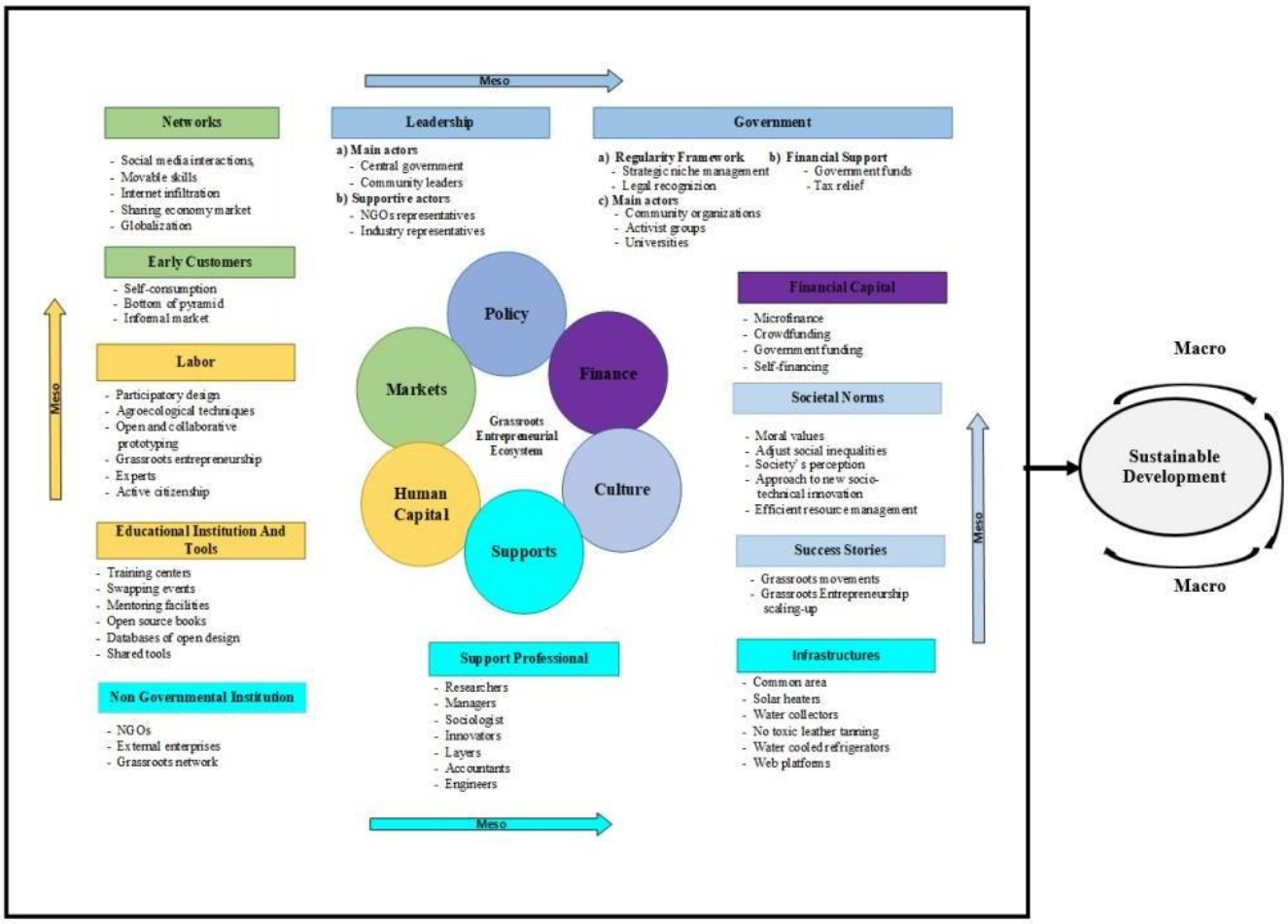

Figure 7: Grassroots entrepreneurial ecosystem

Adapted from (Iseberg 2011)

The theoretical implications of the research want to expand the literature on grassroots innovation and entrepreneurial ecosystems exploring the relationships between different stakeholders that previously have not been considered. This chapter also contributes to the field of sustainability by offering an alternative model that goes beyond traditional approaches, emphasizing the role of citizens in shaping their communities.

From a managerial perspective, this chapter provides insights for all the stakeholders involved in creating grassroots entrepreneurial ecosystems emphasizing the significance of shared knowledge. Indeed, the findings highlight the potential for collaboration between local governments, institutions, and citizens to support the dissemination and adoption of GIs.

Additionally, this research wants to stimulate public investment programs, such as the European Union's NextGenerationEU initiative, in financing GIs with strong social and environmental impacts.

Considering the objective and the contributions of this publication, this chapter serves as a bridge to show what are the general preconditions that favor the emergence of specific grassroots projects to

achieve the Circular Society. While the chapter offers valuable theoretical and managerial contributions, it acknowledges some limitations.

First, this chapter is primarily conceptual, and further research is needed to validate the proposed framework through case studies and empirical analysis.

Second, this model does not consider the characteristics of individual GI projects or the differences between developed and developing countries, which could be areas for future investigation.

In conclusion, this chapter sheds light on the significance of creating the necessary preconditions to stimulate the birth of grassroots innovations. It proposes a conceptual framework that can help policymakers and practitioners to spur and reproduce GIs. The study contributes to both theoretical and managerial understandings of GIs, their relationship with entrepreneurship ecosystems, and their potential to create a sustainable and resilient society.

4.3 Grassroots Eco-innovations perspective

The Circular Society represents a new paradigm in how societies approach economic, social, and environmental sustainability. This model challenges the traditional linear model of take-make-dispose and instead advocates for a closed-loop system where resources are utilized efficiently, waste is minimized, and collaboration fosters long-term sustainability.

Within this context, grassroots eco-innovations emerge as catalysts for transformation, challenging existing norms and driving systemic changes that align with the principles of the Circular Society (Staniškis et al., 2022).

More specifically, the third paper explores the link between education and energy sustainability showing the Circular Society's values of accessibility, transparency and empowerment and social innovativeness. By emphasizing the importance of education in stimulating sustainable and resilient energy systems, the paper aligns with the Circular Society's goal of a well-informed society that actively participates in creating a sustainable future.

The fourth paper deepens the concept of Degrowth through the creation of renewable energy communities. This study is closely related to the Circular Society's focus on closed-loop systems and alternative economic models. Indeed, through the study of how these communities generate and exchange renewable energy locally among different stakeholders, this paper aligns with the Circular Society's goal of decentralizing energy production and promoting community-driven organizations to improve resource management by focusing on the aspect of communality.

The fifth paper examines the role of Artificial intelligence in the context of circular management. This paper aligns with the Circular Society's goal of promoting ethical resource management.

Indeed, this paper shows both how AI enhances production processes by reducing waste but also how AI can be used by communities to promote new models of natural resource management,
The sixth paper focalizes on blockchain's capacity to foster disruptive sustainable innovations.
By exploring the transformative potential of blockchain in various sectors, the paper echoes the Circular Society's principles of collaboration, transparency, and optimization of natural resource management.
Finally, the seventh paper investigates blockchain's role in promoting disruptive eco-innovations within the waste management sector which relates to the Circular Society's aim of optimizing resource utilization empowering communities in natural resource management.
Indeed, showcasing how the blockchain can revolutionize waste management practices through the involvement of the most disadvantaged population groups in the context of developing countries, this paper aligns with the Circular Society's principle to create closed-loop systems contexts.
In summary, these papers provide a comprehensive description of how grassroots eco-innovations align with the Circular Society's principles. They illustrate the potential of education, renewable energy communities, artificial intelligence, blockchain technology, and innovative waste management practices to drive a sustainable and resilient future. By addressing various dimensions of sustainability and emphasizing collaboration, empowerment, accessibility, and communality these papers underscore the Circular Society's goal of reshaping economies and societies within the limits of our planetary boundaries.

4.3.1 Paper three: Energy and education

Title

The impact of education on the Energy Trilemma Index: A sustainable innovativeness perspective for resilient energy systems (Peer-reviewed paper published)

Key themes

Energy Trilemma Index, energy sustainability, education, sustainable innovativeness, energy management

Key outputs

The study investigates the relationship between the Energy Trilemma Index (ETI), which measures secure, affordable, and sustainable energy, and the country's level of education.

I and my co-authors have analyzed if school life expectancy (SLE) and students' predispositions towards STEM degrees (science, technology, engineering, or mathematics) can stimulate the creation of sustainable and resilient energy systems for a transition to a Circular Society.
We have performed a regression analysis using data from 118 countries and employed both ordinary least squares (OLS) regression and a robust-to-outliers MM-estimator.
The study's hypotheses are as follows:
H1: The Energy Trilemma Index is positively associated with school life expectancy.
H2: The Energy Trilemma Index is positively associated with the fraction of persons with a STEM degree compared to the total number of graduates.
The research design includes regression analysis with control variables (see figure 8), and data from 118 countries to test the hypotheses. More specifically, the dependent variable is ETI, which is a composite index measuring energy security, energy equity, and energy sustainability. The independent variables included the number of years spent in school (School Life Expectancy or SLE) and the percentage of graduates in science and engineering (STEM%). The study also considered several control variables, including the Government Effectiveness Index (GEI), Ease of Starting a Business (EOSAB), Electricity Production relative to the population (GEO), and Patents by Origin (PPPGDP) (see formula 1). The statistical investigation reveals that higher school life expectancy is positively associated with the ETI, indicating that countries with longer school life expectancy tend to have higher levels of energy sustainability.

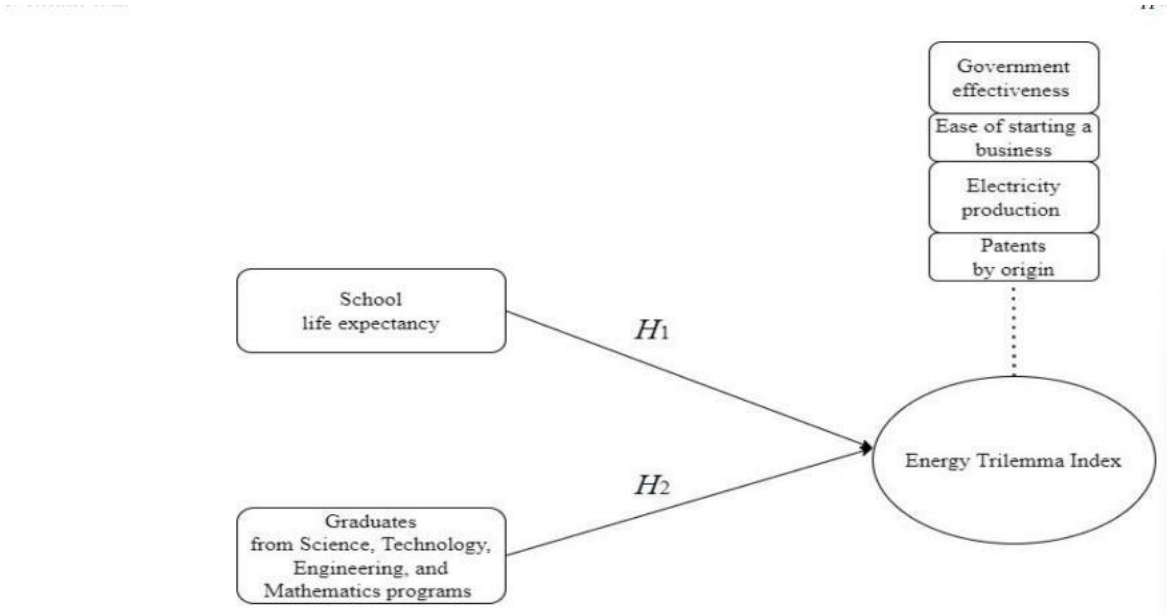

Figure 8: Research design authors' elaboration

$$ETI = \beta_0 + \beta_1 SLE + \beta_2 STEM\% + \beta_3 GEI + \beta_4 EOSAB + \beta_5 GEO + \beta_6 PPPGDP + \varepsilon$$

Formula 1: Energy trilemma index regression analysis

This study finds a significant association between ETI and school life expectancy but no significant association between ETI and the percentage of STEM graduates. It suggests that the number of individuals who continue tertiary education is more important for creating resilient and sustainable systems energy than their attitudes toward studying scientific subjects (see table 5).

Hypothesis	Evidence
H_1: The Energy Trilemma Index is positively associated with the school life expectancy	**Accepted**
H_2: The Energy Trilemma Index is positively associated with the fraction of persons with a STEM degree compared to the total number of graduates	**Rejected**

Table 5: Hypotesis tested.

This research paper contributes to the literature on renewable energy, circular economy, sustainable innovation, and knowledge management by demonstrating the role of education in implementing energy systems that adhere to the triple-bottom-line approach (society, economy, and environment) following the Circular Society perspective. It suggests that sustainable and resilient energy systems can be stimulated not only by environmental and economic factors but also by social factors that play a central role.

From a managerial standpoint, the study suggests that a higher school life expectancy can foster resilient energy systems more than through the creation number of patent and easy of starting a business. For this reason, government have to invest in the school system if they want to spur new companies and new organizational forms in the renewable energy sector. Therefore, this research highlights that investing in education is more effective than solely providing incentives for creating innovative energy companies. Additionally, education stimulates the emergence of new organizational forms in energy management, such as energy communities and off-grid systems.

However, this study has two main limitations regarding its quantitative approach.

First, this study has a limited time interval.

Second, this study does not cluster considering gender and country GDP.

4.3.2 Paper four: Energy Communities

Title

Renewable energy communities and Degrowth: participative governance for energy management (Proceeding published).

Key themes

Renewable energy community, Degrowth, responsible innovations, sustainability

Key outputs

This conference proceeding analyzes the concept of Degrowth and its relationship with renewable energy communities (RECs). Degrowth is a theoretical framework that argues for the necessity of reducing energy and raw material consumption to achieve long-term sustainability goals.

In contrast to the mainstream approach that relies on technological innovation and continuous economic growth, Degrowth emphasizes the importance of alternative consumption models.

RECs, as explored in this paper, offer a novel approach to energy production and consumption that aligns with sustainability and Degrowth principles. RECs generate renewable energy locally and exchange it within the local community in real time. By utilizing a microgrid system, RECs enable the redistribution of energy production among various buildings and stakeholders, fostering more efficient and sustainable energy systems.

Despite previous researchers have analyzed RECs, they have not highlighted in detail the governance implications of these projects, particularly in terms of critical management and new organizational forms. To address this gap, this study conducts a cross-case analysis of nine RECs in Italy, employing the nine dimensions of the Degrowth/Post-growth organizations framework to examine how RECs can adhere to Degrowth principles (see table 6).

The research findings indicate that some RECs in Italy align with Degrowth principles, while others have a stronger focus on profit market-oriented approaches (see table 7).

From the theoretical point of view, this research paper contributes to the literature on Degrowth, responsible innovation, and energy governance by examining the potential of RECs as Degrowth organizations in the context of the energy sector.

This paper also provides managerial contributions, aiming to stimulate the creation of policies that support Degrowth practices in the energy sector and encourage the development of RECs. For this reason, this proceeding shows practical projects that put into practice the principles of the Circular

Society in the energy sector by showing how the same organizational forms can be used for different purposes and objectives depending on the predominant social values of the participants. However, this paper has some limitations.

Indeed, a part of this research is based on theoretical considerations since RECs are a new organizational form born in recent years that continue to have various regulatory limitations to operate at full capacity. For this reason, further empirical investigations are needed to validate the findings.

Additionally, this study focuses solely on Italian RECs, suggesting the necessity for comparative analyzes across different countries to gain a more comprehensive understanding of the relationship between RECs and Degrowth principles.

Dimension	Growth-oriented organizations	Post-growth-oriented organizations
Underpinning Values	Profit Making	Social Justice & Equality
	Competition	Cooperation, Autonomy & Self-sufficiency
	A-cultural	Culturally Specific
	Value-free	Overtly Normative
Underpinning Resources	Organizations that benefit from commodification of common resources pools (e.g. water, land, natural resources, public goods etc.) and labour.	Organizations that oppose commodification and appropriation of the commons. Valorise or reinforce community democratic control over technology.
Ownership & Governance	Privately owned, management led, controlled by private board. Increasingly characterised by trans-national forms of ownership.	Diverse forms of ownership for example, worker-owned coops, community ownerships, local ownership, family ownership, distributed ownership etc.
Production/ Consumption Patterns	Export-oriented, fragmented, geographical and social division of labour. Tendency to separate production/producers from consumption/consumers.	Oriented to local markets, tendency to involve consumers in the decision-making process of the producers.
Surplus	Surplus is usually re-invested to increase total factor productivity. In general, there is no democratic mechanism to decide how surplus is invested.	Surplus can be either re-invested to increase factor productivity or redistributed among the participants. In any case, the decision-making process tend to be democratic.
Intellectual Property	Organizations that usually (with few exceptions) favour strong intellectual property regimes.	Opensource, free-licences, distributed forms of knowledge production.
Technology Design	Expert design, highly reliant on science output, planned obsolesce, constant search for novelty.	Expert plus diffused participatory design. Tendency to produce *convivial forms of technology*.
Power Relationships	These organisations are usually embedded in socio-economic clusters that tend to escape democratic control. They enjoy the support of political elites and scientific institutions.	These organisations usually rely on local social network. Some explicitly challenge dominant power structure in search of social emancipation and autonomy.
Scale	Variable scale with a tendency to huge aggregations and oligopolies.	Reduced scale, tendency to reproduce the model instead of scaling up.

Table 6: Growth oriented vs Degrowth/Post-growth organizations

(Pansera & Fressoli, 2021)

REC models	Can be a Degrowth organization?
Public lead	No
Pluralistic model	Yes
Community energy builder	Partially

Table 7: RECs and Degrowth

(Own calculations)

4.3.3 Paper five: Artificial intelligence and circular management

Title

Dal Management Lineare al Management Circolare: l'Intelligenza Artificiale che Curva la Catena del Valore (From Linear Management to Circular Management: Artificial Intelligence Curving the Value Chain, Book chapter published)

Key themes

Circular management, AI, circular business models, responsible innovations, ethical business model canvas

Key outputs

This book chapter explores the role of artificial intelligence (AI) in promoting circular economy and circular management.

On the one side, the circular economy is presented as an alternative to the linear economy, focusing on preserving natural capital, optimizing resource utilization, and enhancing production system effectiveness. AI has a significant impact on various aspects of circular management. It improves production processes, supply chain management, and waste reduction through the analysis of big data. AI supports the transformation of existing businesses into circular ones by enabling resource tracking, optimizing resource utilization, and simplifying recycling processes. It also facilitates the emergence of new circular businesses by accelerating product and service development, enhancing competitive advantage, and improving pricing strategies. Additionally, the AI is highlighted as a valuable tool for eco-innovation, particularly in the adoption of renewable energy sources and optimizing energy efficiency. The ReSOLVE framework categorizes different circular business

models based on regeneration, sharing, optimization, loop, virtualization, exchange, and AI to contribute to each of these categories. Overall, AI plays a fundamental role in advancing circular management and promoting sustainable and efficient resource utilization in various sectors.

On the other side, the AI enables the inclusion of broader social perspectives in circular models by supporting responsible innovation and involving a wider range of stakeholders. Indeed, this book chapter explores the integration of artificial intelligence (AI) and new forms of innovation in circular business models, going beyond the traditional concept of circular economy (CE).

The Responsible Research and Innovation (RRI) framework is presented to integrate AI into ethical business models and organizational forms that want to create long-term positive social and environmental effects. Additionally, this paper discusses the role of ethics and AI in future businesses, emphasizing the importance of ethical considerations in ensuring legality and social safety for both workers and consumers. Indeed, AI can protect vulnerable groups.

As co-author, I have analyzed the Various criteria necessary for creating ethical AI implementation within organizations, such as multidisciplinary teams, ethical product release, customer involvement, lifecycle analysis, transparency, and collaborations with stakeholders. Finally, this research also explores the application of AI in new forms of governance, in public engagement, and in new organizational forms.

Furthermore, this book chapter presents different business model canvas and their integration with AI and circularity. It discusses the classic business model canvas, environmental business canvas, social business canvas, ethical business canvas, and circular business canvas. Each canvas focuses on specific aspects such as profitability, environmental impacts, social implications, ethical consequences, and material flows management.

Therefore, it suggests that in the context of Industry 5.0, alternative organizational structures and economic models aligned with circularity and sustainability principles could play a leading role.

In conclusion, this book chapter brings two main contributions.

First, it contributes to the literature of circular economy and AI emphasizing the potential of AI to connect profit maximization with environmental protection in circular business models.

Second, this research contributes to the field of responsible innovation and ecological economics showing how AI can be used both to create circular economy models but also to promote the birth of a Circular Society through ethical and inclusive artificial intelligence models.

Finally, this work has a major limitation. Since this research is mostly theoretical, further research is needed to investigate the impact of AI on different business models in different sectors.

4.3.4 Paper six: DSI and blockchain

Title

A systematic literature review of Blockchain for disruptive sustainable innovations: A new Conceptual Framework (Peer-reviewed paper no publication yet)

Key themes

Sustainable innovations, disruptive innovations, blockchain, business ethics, new organizational forms

Key outputs

This paper focuses on the potential of blockchain technology to foster disruptive sustainable innovations (DSIs) that modify socio-technical systems. I and my co-authors have conducted a systematic literature review and a thematic analysis of papers published between January 2016 and December 2022 to explore the applications, organizations, and sectors where blockchain is used to promote DSIs. We propose a conceptual framework that links blockchain with DSIs, highlighting four main perspectives: transforming socio-technical systems, new forms of governance, alternative economy, and new stakeholders involved in natural resource management.

This paper begins with an introduction of the blockchain technology and its disruptive potential, followed by a discussion of its applications in sustainability. It highlights the importance of disruptive sustainable innovations and their potential to bring systemic change. The methodology section explains the use of a systematic literature review enriched by a thematic analysis to gather and analyze relevant research papers. The authors describe the process of data collection and analysis to identify major study trends in the intersection of blockchain and DSIs.

The results of the systematic literature review of 48 publications examine the sources, years, methodologies, and trends of research in this area.

The publications span various disciplines, with 35 distinct journals contributing to the DSI research landscape. Notably, the Journal of Cleaner Production, the Journal of Technological Forecasting and Social Change, and the Journal of Entrepreneurship and Public Policy have prominently featured this topic. The study observes a growing interest in blockchain's interaction with DSIs over the past six years, peaking in 2020 with a subsequent fluctuation.

Four major research subgroups emerge.

First, the disruptive Blockchain section explores how the blockchain can transform socio-technical systems with responsible innovations that support new organizational forms.

Second, the disruptive institutional innovations section shows the blockchain's role in creating new forms of governance, financing, and policies,
Third, the disruptive social innovations section analyzes the blockchain's impact on alternative economies, gender equality, and direct democracy.
Forth, the disruptive eco-innovations section examines blockchain's role in managing natural resources, including biomass trading, energy management, waste recovery, water management, and new green business models.
Instead, the thematic analysis classifies the papers into main four thematic groups and identifies themes within each group (see figure 9)**.**
The themes demonstrate the compatibility and disruptive potential of blockchain technology across various domains. The analysis focuses on four dimensions of disruption.
First, transforming socio-technical systems. This dimension highlights how blockchain disrupts socio-technical systems by involving new stakeholders and citizens in decision-making processes, promoting inclusiveness, transparency, and participation in governance. It also discusses the role of blockchain in centralizing consumers in production processes and reducing poverty through innovative financing solutions.
Second, new forms of governance. This dimension explores how blockchain fosters new governance models by enabling new forms of financing, changing policies, and involving new stakeholders in decision-making processes. It discusses blockchain's potential to redefine relationships between institutional stakeholders, entrepreneurs, and citizens by stimulating the creation of innovative organizational structures.
Third, alternative economic models. This dimension focuses on how blockchain supports alternative economic principles, encouraging social finance, new economic trajectories, and ethical entrepreneurship. It emphasizes blockchain's role in promoting social and economic benefits, facilitating new economic models, and fostering ethical business practices.
Finally, involving new stakeholders in natural resource management. This dimension analyzes blockchain's applications to support eco-innovations, highlighting its ability to integrate consumers, citizens, and other stakeholders in resource management processes. It discusses blockchain's impact on energy management, waste management, water incentives, and on new business models.
This analysis concludes that blockchain technology has the potential to stimulate disruptive, institutional, social, and eco-innovations, leading to significant changes in socio-technical systems, governance models, economic principles, and natural resource management.

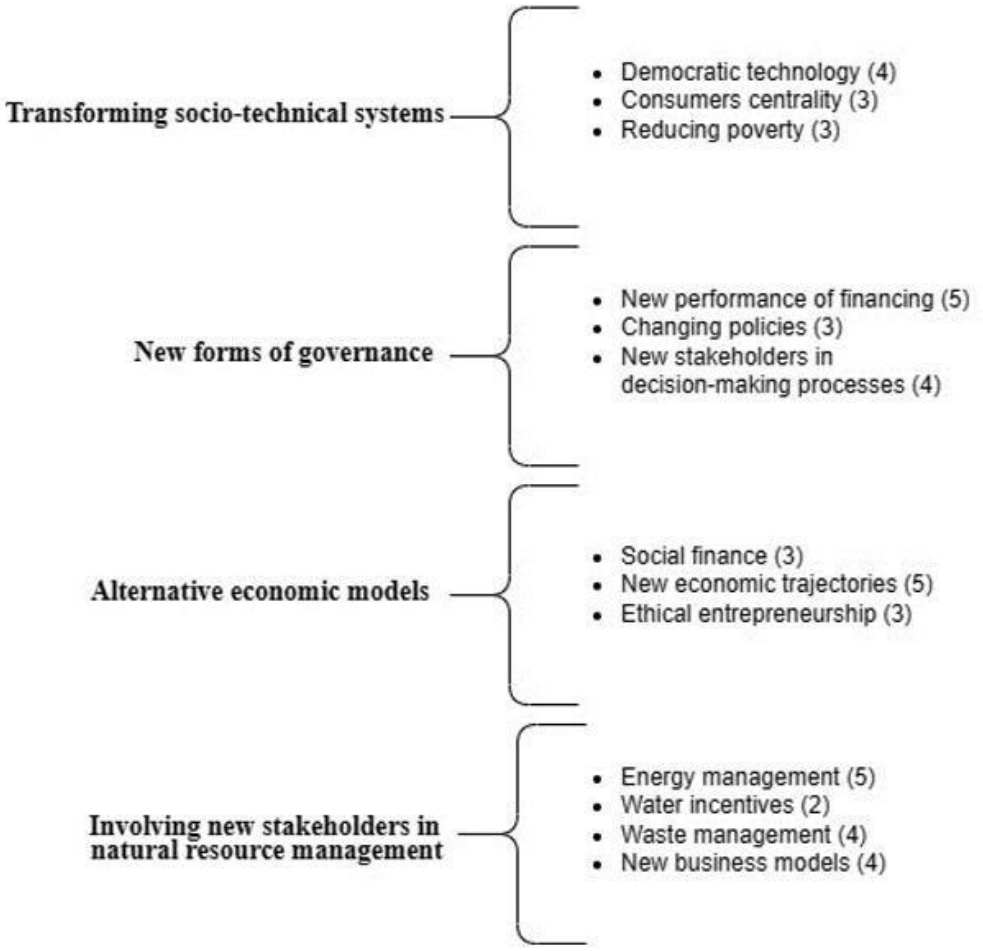

Figure 9: Blockchain and DSIs thematic analysis

Therefore, these findings underline the growing interest in blockchain's transformative potential across diverse domains and emphasize its potential to reshape socioeconomic systems, governance, social entrepreneurship, and natural resource management.

This study brings several contributions. Theoretically, it contributes to the literature on institutional, social, eco-innovations, and sustainable innovations by showing how blockchain stimulates new organizational forms of natural resource management.

From a managerial perspective, it supports the development of new business models that promote sustainable and ethical entrepreneurship.

This research also offers practical insights for policymakers, managers, and citizens to develop DSIs and strengthen environmental and social benefits.

Indeed, we have shown that the blockchain is a technology that brings systemic and multi-level changes, fostering more ethical, shared, and resource-based innovations.

Nonetheless, this research acknowledges some limitations such as a constrained literature scope,

absence of comparative analysis with other digital technologies, restricted evidence of consumer centrality beyond the food sector, uncertain scalability of poverty reduction initiatives, and limited exploration of blockchain's role in non-urban decision-making processes.
For this reason, future researchers should bridge these gaps to provide a holistic understanding of blockchain's impact on various sectors and stakeholders within the framework of sustainable innovation.

4.3.5 Paper seven: Blockchain and waste management from the bottom

Title

Blockchain for Disruptive eco-innovations: A multiple case study for alternative forms of waste management (Conference paper no publication yet).

Key themes

digital entrepreneur, SMEs, digitalization, digital orientation

Key outputs

This conference proceeding explores the potential of using the blockchain to promote disruptive eco-innovations in the waste management sector. This paper highlights the importance of addressing sustainability challenges and reducing the economic gap between different social classes. I and my co-authors argue that incremental innovations are insufficient for achieving long-term sustainability and we call for disruptive eco-innovations that bring about systemic changes. The blockchain, with its decentralized and secure nature, offers opportunities for simplifying and promoting peer-to-peer trade and management of natural resource management.
Despite previous studies have examined blockchain applications in natural resource management, they have not explored its disruptive potential on creating new forms of waste management.
More specifically, this paper presents a conceptual framework that analyzes the application of blockchain technology in the waste management sector from a disruptive eco-innovations perspective. This includes the involvement of new stakeholders, positive environmental effects, and social implications of new forms of waste management. The findings highlight the benefits of including new stakeholders in waste management and the positive environmental impacts of blockchain-based solutions, such as waste reduction and energy recovery (See figure 10).

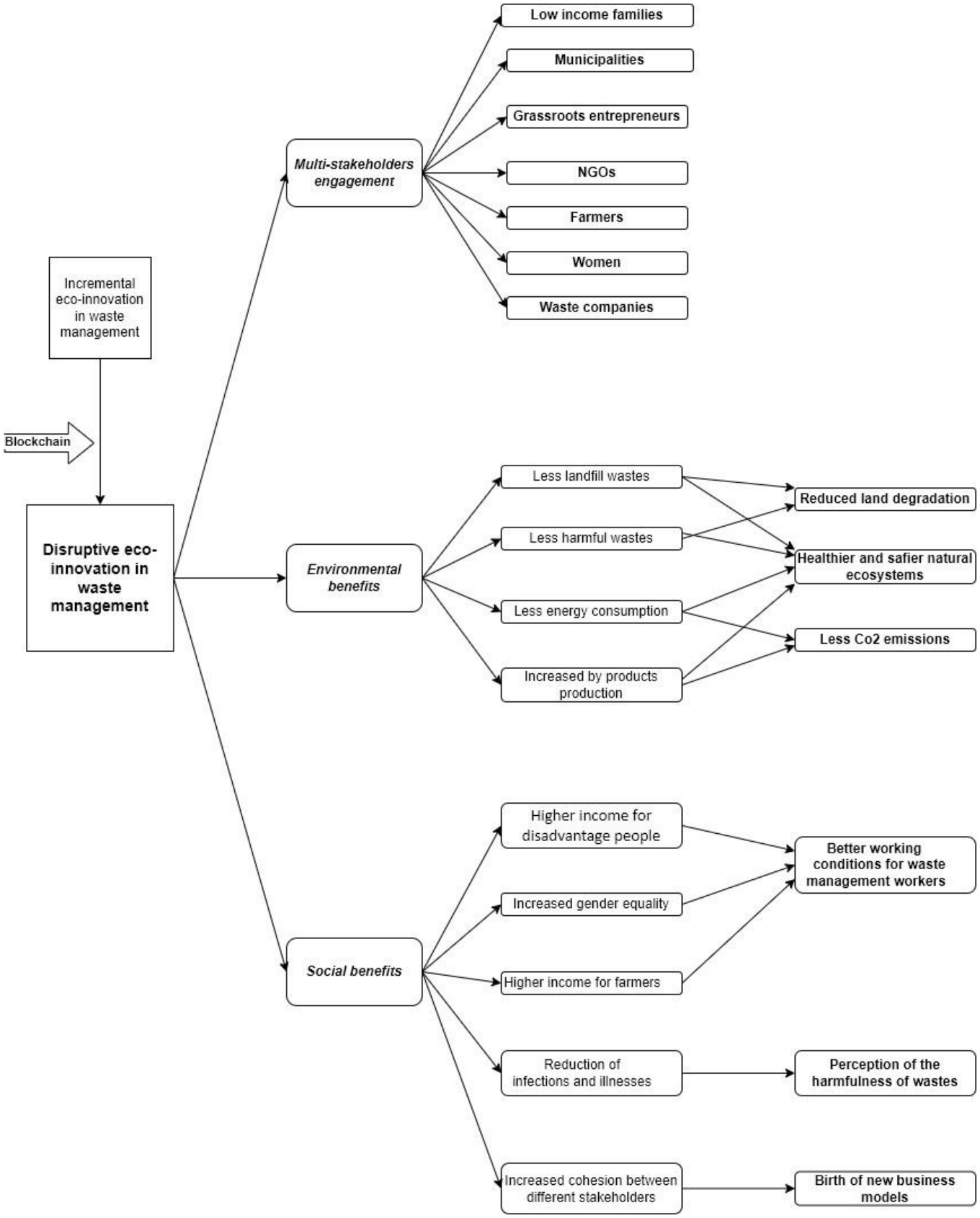

Figure 10: Conceptual framework: Disruptive eco-innovation in the waste management sector

(Own elaboration)

In terms of theoretical contributions, this research contributes to the fields of disruptive eco-innovations, blockchain technology, and sustainability providing insights into the integration of blockchain in waste management for the creation of new organizational models.
From a managerial perspective, this proceeding suggests that blockchain can spur the birth of new business models and calls for policy interventions to support the implementation of multi-stakeholder waste management.
This study also has an important social implication as this new waste management model improves health conditions, enhances social cohesion, and brings economic benefits to disadvantaged groups (see figure 11).
For this reason, this proceeding wants to show how it is possible to create bottom-up waste management models thanks to the use of the blockchain, transforming waste into a resource rather than a cost for the most disadvantaged stakeholders.
However, the proceeding has two main limitations.
First, it is only a conceptual paper. Further empirical research is needed to validate the findings and explore specific case studies.
Additionally, the study focuses on the waste management sector and does not address the potential drawbacks and limitations of blockchain technology. Future researchers should also investigate the applicability of blockchain in other sectors and consider alternative technologies for spurring disruptive eco-innovations.

4.4 Grassroots Social innovations perspective

Grassroots social innovations have emerged as powerful catalysts for reshaping economic paradigms, emphasizing values such as sustainability, inclusiveness, and community engagement (Mehmood & Imran, 2021). These innovations find common ground with the Circular Society's vision, advocating for an economic system that emphasizes resource efficiency, waste reduction, and holistic well-being. This synergy becomes evident in papers eight, nine and ten.
Indeed, this analysis sheds light on how these innovative approaches, driven by bottom-up initiatives and alternative economic models, contribute to the Circular Society's transformational goals.
The eighth paper focuses on Italian Solidarity Purchasing Groups (GAS) in the food sector and shows how these groups are a form of grassroots social innovation, following the ideals of the Circular Society. GAS showcase how local communities can revolutionize consumption patterns

and supply chains, emphasizing ethical practices, reduced packaging, and increasing direct relationships between consumers and small producers. For this reason, by challenging traditional corporate dominance and fostering participatory decision-making, GAS align with the Circular Society's objectives of regenerative systems and waste reduction.
For this reason, this research wants to favor a systemic transformation localizing food resources by promoting to Circular Society's aspiration of closed-loop system.
The ninth paper explores ecofeminist entrepreneurship by introducing a distinctive perspective that unites feminist values, environmental equity, and sustainability aligning with the principles of the Circular Society. This paper underlines how ecofeminist entrepreneurship focuses on gender equality and on the gift and exchange economy reconnecting with the Circular Society's principles of accessibility, communality, and creativity. For this reason, by challenging hierarchical structures through empowerment and promoting cooperation, ecofeminist entrepreneurship contributes to the Circular Society by promoting innovation and social justice.
Finally, the tenth paper analyzes the case study of the Turin fab lab as a tangible manifestation of collaborative, community-based organizational form that aligns with the Circular Society principles. Indeed, this lab focuses its attention on open access to technology, resource sharing, and creative experimentation aligning with the principles of accessibility, transparency and social innovativeness. Indeed, by democratizing access to digital fabrication tools and promoting local resource utilization, the Turin fab lab align with the Circular Society concept.
In summary, these papers show the relationship between social grassroots innovations and the Circular Society's principles. The convergence of values, practices, and objectives underscores the potential of grassroots social innovations to drive transformational change toward sustainability, inclusiveness, and responsible consumption.

4.4.1 Paper eight: Food sector: Solidarity purchase groups

Title

Sustainable disruptive innovations: grassroots innovations for social and circular entrepreneurs (Proceeding published)

Key themes

Disruptive innovations, Sustainable development, grassroots innovations, social innovations

Key outputs

This conference proceeding focuses on the concept of grassroots innovations (GIs) with a particular focus on social innovativeness in the food sector. Indeed, this proceeding analyzes how GIs can be considered a form of social disruptive innovation (see figure11). More specifically, this proceeding examines the case study of an Italian food community known as Gruppo di Acquisto Solidale (GAS) (solidarity purchase groups) evaluating if it follows the five characteristics of catalytic innovations (that can be considered a form of disruptive social innovations) as proposed by Christensen and colleagues in 2006.

	Features of Innovation													
Type of Innovations	Community led initiatives	Interest driven	Network	Bottom-up	Value based	Affordable	Adaptable	local	Frugality	Indigenous	Learning	Intrinsic	User friendly	Sustainable
Catalytic innovation	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗	✗	✓
Disruptive innovation	✗	✗	✗	✗	✗	✓	✗	✗	✓	✗	✗	✗	✓	✗
Frugal Innovation	✗	✗	✗	✓	✗	✓	✓	✓	✓	✗	✗	✗	✓	✓
Gandhian innovation	✗	✗	✗	✗	✗	✓	✗	✓	✓	✗	✓	✗	✓	✓
Indigenous innovation	✗	✗	✗	✗	✗	✗	✓	✓	✗	✗	✓	✗	✗	✓
Jugaad	✗	✗	✗	✗	✗	✓	✓	✗	✓	✗	✗	✓	✗	✗
Reverse innovation	✗	✗	✗	✗	✗	✓	✓	✓	✓	✗	✗	✗	✓	✗
BOP innovation	✗	✗	✗	✗	✗	✓	✗	✓	✗	✗	✗	✗	✗	✗
Resource-constrained innovation	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗
Grassroots innovation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Figure 11: Different social innovation forms

(Singh et al., 2020)

Therefore, this research show that the Italian GAS follows the principles of catalytic innovations. First principle of catalytic innovations: Through scaling-up and replication, they bring systemic societal transformation. Solidarity purchase groups emerged in Italy, starting in 1994, as a means of achieving systemic societal transformation. These groups promoted fair behavior and critical consumption, initially through collective purchases, with participants selecting seasonal and organic foods, assisting small farmers, and prioritizing local sourcing. The movement expanded through networking and the internet, now totaling 170 registered groups, facilitating direct relationships between consumers and small producers while challenging the dominance of larger corporations and shopping centers. The GAS principles encompass diverse elements like sustainable food selection, local sourcing, reduced packaging, resisting media and market influences, fostering producer-consumer dialogue, building network trust, and considering the durability of goods. Second principle of catalytic innovations; They fill a need in the market that is either overserved or completely unsatisfied. The Italian GAS fill a need in the market that is either overserved or completely unsatisfied. Indeed, this GAS address an unmet need in the market by promoting responsible and ethical food consumption. Many individuals lack awareness of product seasonality and the origins of their food, often resulting in the consumption of non-seasonal or processed items.

This GAS aims to enhance consumer consciousness by fostering mutual support and knowledge-sharing among participants, encouraging more informed consumption practices.

Third principle of catalytic innovations: They provide goods and services that are either easier to use and less expensive than the alternatives. The Italian GAS provides goods and services that are either easier to use or less expensive than the alternatives. Indeed, this GAS survives due to the quality of its members, who share strong convictions and values, resulting in self-regulation and collaborative purchasing practices that eliminate intermediary costs like wholesale, distribution, and advertising. This approach is driven by a commitment of ethical consumption, contributing to the success of the GAS model.

Forth principle of catalytic innovations: They generate resources in undesired ways, such as volunteering, intellectual assets, contributions, or donations. The Italian GAS provides goods and services that are either easier to use or less expensive than the alternatives. Indeed, this GAS functions as a non-profit organization, with participants motivated by ethical principles rather than economic gain. Voluntary work and intellectual capital play a significant role, as both consumers and producers dedicate time to educating others about product origins, zero-kilometer principles, and organic practices. This commitment to sharing knowledge and ethical engagement underscores the foundation of GAS.

Fifth principle of catalytic innovations. They are frequently rejected, disparaged, or even supported by established players who refuse or withdraw from the market sector because the business strategy is unprofitable: Italian GAS is often rejected, and denigrated, by established operators who refuse or withdraw from this market sector because the strategy is unprofitable or in any case unattractive. Indeed, this alternative approach of Italian GAS challenges the main players in the market. While supermarkets and food multinationals give priority to variety, this GAS focuses on raising awareness towards the consumption of local and seasonal products to respect the environment. By sourcing directly from producers and bypassing traditional distribution chains, GAS threatens the dominance of supermarkets and large producers, becoming a distinct and contrasting alternative in the market.

In summary, GAS functions as a network of people organizing collective purchases of local products from short distribution chains and embodying the characteristics of catalytic innovations: it promotes systemic societal transformation, fills a market need for ethically conscious consumers, provides accessible and affordable solutions, generates resources through voluntary efforts, and faces resistance from conventional market players.

This research brings some important theoretical and managerial contributions.

From the theoretical point of view, this research offers a narrative tool of GAS by showing how this

group promotes disruptive social innovations, bringing a contribution to the fields of social innovations and grassroots innovations.
Instead, from the managerial point of view this study recognizes the importance of GAS as a form of disruptive social innovation to stimulate policies that favor the birth of new groups in other sectors. However, this proceeding also acknowledges a main limitation. Indeed, this study analyzes only a single case study. Future researchers should analyze other projects to generalize findings to different contexts and sectors.

4.4.2 Paper nine: Clothes sector: Eco-femminist entrepreunership

Title

Ecofeminism and entrepreneurship: The case study of People's Bank of Govanhill (Proceeding published)

Key themes

Ecofeminism; Sustainable innovations; Alternative organizations; Degrowth

Key outputs

This paper explores the concept of ecofeminist entrepreneurship through the case study of the People's Bank of Govanhill. This paper aims to identify the characteristics of ecofeminist entrepreneurship and how it differs from traditional business models based on neoliberal principles. The study adopts a case study methodology. The People's Bank of Govanhill, founded by Ailie Rutherford, emerged from currency experiments and workshops, aiming to implement feminist economics locally and explore alternatives to capitalism. It includes initiatives like the Swap Market for currency-free trading and cultural exchange. The study methodology relies on literature analysis, documents, and materials collected from the People's Bank of Govanhill, with plans for future interviews with the project's founder. The results of the analysis revealed several key findings. First, this project implements their activities following the principles of Economy as an Iceberg. This framework recognizes that traditional market economics represents just the visible tip of the iceberg, with many other economic activities hidden by the surface. These hidden activities contribute to well-being and include illegal labor, alternative markets, cooperatives, volunteering, and unpaid work. This project implements this principle toward the time banking (using time and as a means of exchange for basic needs for exchange), a gift economy (non-monetary reciprocal trade),

and clothes swapping to foster cooperation and sustainable practices.

Second, the underpinning values. This project is guided by ecofeminist values that emphasize gender equality, non-patriarchal structures, respect for organic processes, and collaboration. Values like freeganism (reducing engagement in the traditional economy through resource recovery), anti-racist and anti-colonial feminism (challenging supremacy and heteronormativity), and equitable research (addressing unequal power dynamics in research) shape the initiative's approach.

Finally, Alternative Currencies. The People's Bank of Govanhill is exploring the integration of blockchain technology to enable resource-sharing and meet community needs. The aim is to counteract potential inequalities caused by our technocratic system and establish a decentralized economy for exchanging resources and information to shift toward a cashless economy. The project's origin lies in community currency experiments and workshops, with a current focus on creating a decentralized cryptocurrency using blockchain technology.

Additionally, this paper shows how Ecofeminist entrepreneurship distinguishes itself from neoclassical entrepreneurship (see table 8). Indeed, these two organizational forms differ in values, resources stakeholders involved, and the organizational structures. While neoclassical models focus on profit and competitive markets, ecofeminist approaches prioritize equality, ethical consumption, and community justice. Neoclassical organizations exploit resources, whereas ecofeminist ones redistribute them, fostering communal goods through concepts like the gift economy. Stakeholders in neoclassical settings involve customers and shareholders, while ecofeminist initiatives prioritize volunteers, marginalized communities, and women, promoting worker-owned models and horizontal management. Organizational structures differ too, with neoclassical corporations having hierarchical boards, while ecofeminist groups adopt horizontal structures where members share equal value.

Characteristics	Capitalistic Organization	Ecofeminist Organization
Values	-Maximization of profit -Reproducible -Deterritorialized -Bigger is better -Global	-Equity -Environmental justice -Territorialized -Reproduction -Local
Resources	-Money -Salaried labor -Commodification -Natural resources -Market	-Time banks -Gift economy -Swapping -Wastes -Informal market
Main Stakeholders	-Customers -Employees, -Shareholders -Suppliers	-Volunteers -Local communities -Ethics and gender minorities -Women
Organizational structure	-Pyramidal -Companies -Patriarchal	-Horizontal -Cooperatives -Matriarchal

Table 8: Characteristics of capitalistic and ecofeminist organizations

Source: our elaboration

This research concludes by providing managerial and theoretical contributions.

From the theoretical point of view, this research contributes to the existing literature of social innovation, critical management, and ecological economics by demonstrating the possibilities of ecofeminist entrepreneurship in promoting social justice, equality, and sustainable consumption models.

From the managerial point of view, this research wants to stimulate the development of new ecofeminist entrepreneurship by providing guidelines for entrepreneurs and governments to support the creation of these organizations. For this reason, the main objective of this paper is to show how it is possible to create new organizational forms that differ from the principles of the capitalistic economy by following other economic principles that are in line with the Circular Society.

Finally, this paper acknowledges some limitations since it is a single case study without having interviewed the people involved in the project. Future researchers should explore more case studies, examine ecofeminist entrepreneurship in different industries and contexts, and further investigate this project's potential for social change and long-term sustainability in the context of the Circular Society.

4.4.3 Paper ten: Technology sector: Fab labs and democratic innovations

Title

Fab Labs for Sustainable Cities of the Future: Re-evaluating the Smart City Concept (Peer-reviewed paper no publication yet)

Key themes

Grassroots innovations; makerspaces; democracy; makerspaces; digital fabrication; open-source technology

Key outputs

This paper explores the concept of fab labs as laboratories that provide access to digital fabrication tools and technologies to various stakeholders, including citizens.

Fab labs can be categorized into university fab labs, company fab labs, and free fab labs. The focus of this research is on free fab labs, which are non-profit associations without conflicts of interest. These free fab labs are seen as alternative models to mass production, promoting open innovation and long-term sustainability. This paper aims to consolidate existing literature on the methods and motivations behind the use of fab labs by citizens, their implications for sustainability, and the role of policymakers. To achieve this, the authors conducted a case study analysis of the Turin Fab Lab, the oldest free fab lab in Italy. The case study involved a literature review, document analysis, and semi-structured interviews with 14 key stakeholders. The study investigates four main research questions.

First, this research explores which citizens use fab labs. Fab labs offer citizens access to digital fabrication tools such as 3D printers, CNC milling machines, and vinyl cutters, which are typically only available to professionals. This case study reveals that citizens from diverse backgrounds, including designers, architects, artists, and students, use the fab lab for various projects and collaborations. This laboratory serves as a platform for learning, experimentation, and the creation of innovative prototypes.

Second, this paper examines how Fab Labs can contribute to long-term sustainability goals. Fab Labs present great environmental benefits, such as promoting the circular economy using recycled materials and reducing energy consumption compared to conventional production. Furthermore, this study highlights how 3D printers in fab labs can use locally recycled materials reducing reliance on

virgin materials. Fab labs also encourage the creation of start-ups that prioritize environmental protection, social cohesion, and new production methods. Indeed, this research highlights the role of Fab Labs in supporting the development of new sustainable business models that contribute to the principles of the circular economy.

The third research question analyzes the motivations that lead citizens to use the Turin fab lab. This study reveals that citizens are motivated by factors such as access to technology, learning opportunities, community building, and the ability to satisfy their specific needs and interests. Fab labs offer a more inclusive and democratic approach to innovation, allowing individuals and communities to actively participate in the design and creation process.

Finally, the last research question asks what the benefits deriving from the Turin fab lab are for policymakers and other interested stakeholders. Policymakers can benefit from integrating Fab Labs into the development of smart cities, ensuring that citizens' needs and perspectives are adequately represented. The analysis of this case study shows its evolution in the context of the Turin smart city over time. The lab started as a workshop focused on Arduino projects, with a small group of engineers and computer scientists. Over the years it has expanded its activities, added new equipment, and diversified its areas of interest. The fab lab hosted educational programs, entrepreneurial initiatives, and collaborative projects. It has formed partnerships with universities, companies, research institutes, and local authorities, fostering a collaborative ecosystem. This case study also highlights the birth of successful start-ups that emerged from the fab lab thanks to the free use of machinery and the free diffusion of knowledge by exploiting the resources, skills, and communities born in this laboratory.

This paper brings several contributions.

Theoretically, it contributes to the literature on grassroots innovations and critical management by demonstrating the potential of fab labs in promoting sustainable innovation and inclusive participation. Indeed, this research suggests that fab labs can complement existing smart city models by fostering new forms of innovation management aligned with sustainability principles.

From a managerial perspective, the paper advocates for policies that facilitate communities and citizens involvement in digital innovations and management processes. It highlights the importance of creating socio-technical niches within smart cities to encourage community-led initiatives to empower citizens.

However, this paper has two main limitations because it is a single case study.

First, future researchers have to deepen this research by exploring different fab labs to understand if the considerations of this study apply in different contexts

Second, this paper calls for a deeper reflection on the long-term implications of personal

manufacturing in fab labs and the need for conscious practices to ensure environmental sustainability as the implications at a social level can be extended to any context.

In conclusion, this research emphasizes the significance of fab labs in reevaluating the concept of smart cities and promoting sustainable innovation. Fab labs provide access to digital fabrication tools, foster community engagement, and facilitate collaboration between citizens, professionals, and researchers. This paper suggests that policymakers should embrace the bottom-up approach of fab labs and create policies that support their development and integration within smart city frameworks. By doing so, cities can empower their citizens, promote environmental sustainability fostering inclusive and participatory innovation.

4.5 Summary

This chapter offers a comprehensive exposition of the different papers within the confines of this thesis framework. It furnishes a detailed overview of each of the ten papers that have been developed during the thesis process. Furthermore, it delineates the theoretical and practical interconnections among these publications.

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Main results: Key elements for realizing a Circular Society
Chapter Five

5.1 Introduction

The previous chapter delineated the research trajectory of this thesis, offering a concise overview of the ten publications within its scope, and elucidated the theoretical and practical connections that bind these works together.

Instead, this chapter is focus on presenting the primary results that underscore the essential elements required to create the Circular Society, aligned with the principles at Jaeger-Erben.

5.2 Grassroots entrepreneurial ecosystem in the context of the Circular Society

In the broader context of the Circular Society and its various dimensions, grassroots entrepreneurial ecosystems play a fundamental role by catalyzing and facilitating the realization of projects that align with the principles of the Circular Society. The grassroots entrepreneurial ecosystem provides a fertile ground for large-scale implementation or for the birth for large-scale implementation of grassroots innovation with the goal to of improving social cohesion and environmental protection. This ecosystem encourages local communities and individuals to design, experiment, and implement innovative solutions in line with the principles of the Circular Society (Calzada, 2019). By promoting a culture of innovation at the local level, the entrepreneurial ecosystem becomes a living laboratory in which a new bottom-based approach approaches to sustainable consumption, from waste reduction to ethical production, can flourish enabling people to collaboratively design solutions that address local challenges (Jaeger-Erben et al., 2020).

Furthermore, the grassroots entrepreneurial ecosystem plays a significant role in promoting the energy transition according to the Circular Society principles. By providing a network of different stakeholders useful to local innovators and entrepreneurs to develop localized renewable energy solutions, the ecosystem contributes to the transition from fossil fuels to sustainable energy sources. (Wittmayer et al., 2022). Entrepreneurs and communities within this ecosystem can design and implement localized renewable energy systems, such as solar microgrids, wind energy projects, and energy-sharing models based on the energy communities' approach. These initiatives not only accelerate the energy transition but also promote community ownership and engagement, aligning with the principles of democratization and collaboration of the Circular Society (Bauwens et al., 2022).

In addition, the grassroots entrepreneurial ecosystem is useful for exploring and integrating the artificial intelligence (AI) within communities by promoting ethical use of technology (Allam & Dhunny, 2019). Entrepreneurs and communities within this ecosystem can leverage artificial intelligence and blockchain to optimize resource allocation, streamline supply chains, and improve waste management by integrating new stakeholders into managing these processes (Swartz, 2017). Thus, this ecosystem provides an enabling environment for innovators to develop circular AI-powered solutions and blockchain-based platforms that improve accessibility, transparency, and citizen empowerment and collaboration, in accordance with the principles of circular societies (Singh et al., 2020).

Finally, the grassroots entrepreneurial ecosystem plays a central role in fostering key sectors for self-management. Through new organizational forms, social entrepreneurship, and grassroots movement this ecosystem enables communities to develop localized solutions for food production, waste management, water waste management, and much more (Rossi et al., 2021). Entrepreneurs and communities can, in this context, create circular business models that prioritize natural resource management by reducing waste and promoting the adoption of multi-stakeholder engagement in production processes in compliance with the principles of the circular society of accessibility, communality, and democratization. (Sharma et al., 2021). Therefore, by supporting key sectors through self-management, the grassroots entrepreneurial ecosystem contributes to the resilience and sustainability of our society, aligning with the goals of the Circular Society.

In summary, the grassroots entrepreneurial ecosystems provide a fundamental context that facilitates the realization of the Circular Society. By fostering innovation, collaboration, and localized solutions, this ecosystem catalyzes the implementation of grassroots innovations, supporting the energy transition, integrating AI and blockchain technologies, and empowering communities for self-management in key sectors.

5.3 Deep analysis of grassroots innovations

An in-depth analysis of grassroots innovations presents a comprehensive understanding of their profound implications within the framework of the Circular Society. Through the three categories analyzed (grassroots institutional innovation, grassroots eco-innovations, and grassroots social innovations) this collection of papers reveals the transformative potential of grassroots initiatives in reshaping economic paradigms and promoting the principles of sustainability, inclusiveness, empowerment, collaboration, and responsible consumption (Seyfang & Haxeltine, 2012; Lorek & Spangenberg, J2014; Becerra et al., 2020; Savelyeva & Park 2022).

First, grassroots institutional innovation, show the role of collaborative networks and participatory governance mechanisms in promoting transformative change. These initiatives, such as the creation of supportive policies for creating transition towns and for implementing grassroots entrepreneurial ecosystems, show how grassroots initiatives can challenge the current economic system and support the objectives of the Circular Society (Magnani & Osti, 2016). Furthermore, these types of innovation can also challenge current governance models to promote models that arise from the bottom (Sage et al., 2021). Indeed, by redistributing power, resources, and decision-making, these grassroots innovations lay the foundations for inclusive economic models that prioritize community well-being over profit.

Second, documents that analyze grassroots eco-innovations show that ecological challenges can be solved by innovative solutions emerging from local communities (Hossain, 2016). These documents highlight the importance of respecting raw materials through the creation of new organizational forms that promote local consumption such as renewable energy communities. Furthermore, these papers show how important it is to create circular business models to propose alternative economic models. From community efforts to build inclusive energy systems to localized waste management strategies, these initiatives show how grassroots interventions can effectively mitigate environmental degradation, improve resource efficiency, and drive a participatory and inclusive change where the principles of the Circular Society are respected (Mouzakitis & Adamides, 2019).

Furthermore, this section shows the importance of artificial intelligence within the context of the Circular Society. New technologies play a key role because they make it possible to simplify the implementation of certain economic and organizational structures (Swartz, (2017). For this reason, artificial intelligence became an enabling technology to realize ethical and participatory use of eco-innovations (Ioannis et al., 2017; França et al., 2020).

More specifically, Solidarity Purchase Groups (GAS), exemplifies how communities can challenge conventional consumption patterns and supply chains, aligning with the Circular Society principles of ethical consumption and waste reduction (Fonte, 2013).

Instead, ecofeminist entrepreneurship introduces gender equality, ethical values, and community collaboration in entrepreneurial initiatives, reconnecting to the principles of the Circular Society of accessibility and empowerment (Widianingsih et al., 2022).

Finally, the research regarding fab labs emphasizes how open innovation and knowledge sharing can contribute to the Circular Society principles of open innovation and sustainable production empowering local communities and democratiziting innovations (Smith, 2017).

In summary, grassroots innovations underscore their vital role in driving systemic change (Scoones et al., 2020). The convergence of values, practices, and objectives between grassroots initiatives and

the Circular Society highlights their potential to follow alternative economic paths that consider sustainability, inclusiveness, and responsible consumption (Jaeger-Erben et al., 2020). By democratizing access to resources, challenging traditional economic models, and fostering community engagement, grassroots innovations offer a path to a more regenerative, equitable, and resilient future (Seyfang & Smith, 2007).

These documents reinforce the idea that the widespread and capillary introduction of grassroots innovations can bring a transformative change pushing society toward a prosperous circular future following all the principles of sustainability.

5.4 The role of energy transition

The energy transition represents one of the fundamental aspects of the Circular Society thanks to its intrinsic ability to improve the accessibility and transparency of the energy systems (Cantarero. 2020). Documents three and four show that the transition from fossil fuels to renewable energy sources aligns with the principles of the Circular Society of reducing resource exploitation, minimizing waste, and promoting sustainable practices within communities. Indeed, Thanks to the diffusion of renewable energy communities, green technologies are increasingly accessible for an increasing number of stakeholders through the free exchange of energy (Ines et al., 2020).

It enables individuals and communities to actively engage in energy production and distribution by implementing an energy transition model that contributes to create a resilient and participatory energy landscape (Koirala et al., 2016).

Furthermore, the link between energy transition and the Circular Society focuses on the empowerment and democratization of the citizens. Indeed, the transition to renewable energy allows to create decentralized energy production and community-led projects, as highlighted in papers three and four. These initiatives align with the Circular Society's call for a democratized decision-making process and localized management of resources (Magnani & Osti, 2016)**.** By enabling individuals and communities to generate their energy, the energy transition gives them a sense of ownership over their energy future fostering their empowerment.

Furthermore, collaboration and community are intrinsic outcomes of the energy transition. The transition to renewable energy requires cooperation between different stakeholders, including local communities, businesses, and institutions as the fourth paper points out. These collaborations foster stronger bonds within communities and promote shared goals (Gui, & MacGill, 2018)**.**

Finally, the energy transition catalyzes social innovativeness and creativity, fostering new solutions. Documents three and four show how renewable energy communities can stimulate the birth of new

forms of social innovations (Dall-Orsoletta et al., 2022).
In summary, efforts towards a bottom-up energy transition show the potential of individuals and communities to find alternative energy solutions. This concept aligns with the Circular Society's call to find creative problem-solving and adaptation strategies, toward the transformative potential of the bottom-up energy transition.

5.5 The role of artificial intelligence and blockchain

Papers five, six, and seven highlight the role that artificial intelligence (AI) and the blockchain play in creating the Circular Society. Indeed, the use of these technologies, if used ethically, makes it possible to accelerate the creation of an organizational forms that follows the principles of the Circular Society (Mehr et al., 2017).
More specifically, AI can be a tool that improves resource accessibility and transparency.
AI-based solutions can optimize and make resources and information more accessible and transparent by tracking material flows and facilitating the recycling and regeneration processes (Kurniawan et al., 2023).
Instead, the decentralized and transparent nature of the Blockchain allows individuals and communities to directly engage in asset management, product traceability, and circular business models (Lee et al., 2019). Through peer-to-peer transactions and secure data sharing, blockchain facilitates fair and equitable participation, aligning perfectly with the Circular Society's demand of democratized decision-making (Swartz et al., 2017).
Additionally, both artificial intelligence and blockchain foster collaboration within communities. Platforms based on artificial intelligence enable collaborative consumption models through sharing economy models, optimizing products use and reducing excessive consumption (Wirtz et al., 2019). Instead, the blockchain paves the way for decentralized marketplaces, where local communities can engage in peer-to-peer exchanges and resource sharing, promoting mutual benefits and strengthening community ties (Adu-Kankam & Camarinha-Matos, 2022). For these reasons, these technologies stimulate a sense of shared responsibility promoting a multi-stakeholder engagement in line with the vision of a Circular Society.
Finally, artificial intelligence and blockchain function as catalysts for social innovations and creativity. Indeed, alternative organizational forms focused on the improvement of population well-being can use artificial intelligence and the blockchain to promote innovative approaches of natural resource management (Maksimovic, 2018). For instance, the potential of blockchain to tokenize assets and create incentive structures for sustainable practices encourages the birth of social

business models that prioritize social well-being in line with alternative economic models (Swartz, 2017). This dynamic interaction amplifies the effect of new forms of social innovation by stimulating the birth of new ideas that reshape the consumption and production models.
In summary, artificial intelligence and blockchain play a central role in shaping the Circular Society. Documents five, six, and seven highlight the interaction of new technologies and the principles of the Circular Society. By leveraging artificial intelligence and the blockchain organizations can revolutionize accessibility, democratization, empowerment, collaboration, and creativity, through new ethical models of natural resources management. As organizations attempt to overcome the classic paradigms of the circular economy, the transformative capabilities of artificial intelligence and blockchain prove to be valuable allies, shaping a future characterized by efficient use of resources, responsible consumption, and democratization of technology.

5.6 Key sectors for community self-management

This section show the importance of key sectors for community self-management in driving the implementation of the Circular Society. Indeed, the paper illustrates in this thesis show how the self-management of specific key sectors (energy, food, waste, and technology sectors) play a central role in aligning creating the Circular Society.
As said before, documents three and four explore the fundamental role of the energy transition in building circular societies. The energy sector is a key sector for community self-management, as the transition from fossil fuels to renewable sources is an integral part of reducing resource dependence and environmental degradation. In this context, self-production and self-consumption of energy allow you to optimize energy consumption and keep all accountable stakeholders. (Pellicer-Sifres et al, 2018).
In fact, in the energy sector, community self-management promotes the use of renewable energy sources such as solar, wind, hydroelectric, and geothermal energy. These sources are inherently regenerative and abundant, allowing communities to harness energy without depleting limited resources or generating harmful waste (Stephens et al., 2019). Therefore, by relying on models that rely on the self-production and self-consumption of renewable energy, circular societies minimize resource extraction and reduce the environmental impact associated with traditional fossil fuel-based energy production (Jaeger-Erben et al., 2020). In addition, self-sustaining energy systems have a s lower environmental impact than centralized power generation (Li et al., 2021). Renewable energy sources emit less greenhouse gases and pollutants, helping to make the air cleaner and reduce the impact of climate change (Sovacool et al., 2021).

Additionally, In the context of energy community self-management, communities can engage in energy sharing and exchange through microgrids and local energy cooperatives. Excess energy generated from renewable sources can be shared with nearby communities, contributing to a more balanced energy distribution, and minimizing waste. (Neska & Kowalska-Pyzalska, 2022).
Moreover, the pursuit of energy community self-management often drives innovation and the development of new technologies (Aguilar et al., 2021). It can lead to advances in energy storage, distribution, and efficiency (Jaeger-Erben et al., 2020).
Furthermore, the implementation of self-sufficient energy systems can lead to local economic benefits. Employment opportunities can arise from installation and maintenance of the renewable energy infrastructure (Tsagakari et al., 2021).
Additionally, communities can save money on energy bills and can create revenues from excess energy.
Finally, the Circular Society prioritize long-term sustainability. Investing in self-sustaining energy systems ensures a cleaner and more resilient energy future for future generations (Carley et al., 2021).
In summary, community self-management in the energy sector closely aligns with the principles of the Circular Society, promoting resource efficiency, environmental responsibility, decentralization, collaboration, innovation, empowerment, and long-term sustainability. By embracing renewable energy sources creating renewable energy communities the Circular Society favor the birth of a more resilient, equitable, and environmentally friendly energy system.

Community self-management in the food sector is closely aligned with the principles of a Circular Society as they share many principles. As previously mentioned, the Circular Society prioritizes the efficient use of resources to minimize waste and promote sustainability. In the food sector, community self-management encourages local production and consumption of food, reducing the need for long-distance transport and minimizing the associated environmental impacts (Papaoikonomou & Ginieis, 2017). Solidarity purchase groups, as highlighted in the document, focuses on sourcing local, seasonal, and organic food to reduce the carbon footprint associated with food distribution. Additionally, Solidarity purchase groups support more efficient use of agricultural resources promoting the reduction of packaging and waste (Baldi et al., 2019).
Additionally, solidarity purchase groups promote direct relationships between consumers and local producers, fostering community resilience and ensuring a constant supply of seasonal food through traditional agricultural practices such as permaculture that promote biodiversity and improve soil health (Counihan, 2018).

Besides, purchase solidarity groups engage consumers in the food production process fostering a sense of connection between consumers and the source of their food increasing transparency and empowerment. Indeed, Solidarity purchase groups, through its community-driven approach, encourages consumers to actively participate in the decision-making processes and to build relationships with local producers, strengthening ties with the communities (Brurori et al., 2012). Moreover, the Circular Society values ethical consumption practices that prioritize social and environmental responsibility. Community self-management promote ethical choices by supporting local farmers and producers who adhere to sustainable agricultural practices (Cembalo et al., 2013). Indeed, solidarity purchase groups give priority to consumer behavior and the ethical selection of food, in line with the principle of responsible consumption (Giampieri et al., 2018).
Finally, the Circular Society aims to reduce greenhouse gas emissions and fight climate change. Community self-management in the food industry helps to reduce carbon footprint by decreasing the distance food travels from farm to consumer. (Malak-Rawlikowska et al., 2019).
In summary, community self-management in the food sector, through solidarity purchase groups, aligns with the principles of a Circular Society by promoting resource efficiency, closed-loop systems, local resilience, biodiversity, community engagement, ethical consumption, and the reduction of the carbon footprint. By embracing community self-management in food production and consumption, the Circular Society create a more resilient, sustainable, and interconnected food system that benefits both people and the planet.

Community self-management in the waste sector means that waste management practices are managed directly by the communities through a multi-stakeholder approach (Gutberlet et al., 2017). More specifically, the Circular Society prioritize the recovery and reuse of materials to minimize waste and reduce the demand for virgin resources (Muscat et al., 2021). In the waste sector, community self-management implies the adoption of advanced technologies and innovative processes by citizens to recover valuable resources from waste streams (Zapata et al., 2023). These practices help create a closed-loop system in which waste can be re-used (Graziano, & Trogal, 2023). Community self-management in the waste sector includes the implementation of waste-to-energy technologies, such as anaerobic digestion and incineration for energy recovery at the community level. These technologies convert organic waste and non-recyclable materials into energy, which can be used to power homes or other buildings reducing dependence on fossil fuels (Gutberlet, 2015).
Additionally, the Circular Society aims to create local and decentralized systems of waste management to create closed loops (Sharma et al., 2021). Community self-management in the waste

sector implies the creation of community-based waste management initiatives, as discussed in the papers. These initiatives may include local composting facilities, small-scale recycling centers, and collaborative efforts to manage waste within neighborhoods or communities (Charles, 2021). Additionally, community self-management in the waste sector involves the creation of collaborative networks between stakeholders, including consumers, producers, waste management companies, and local authorities. These networks can facilitate the exchange of resources, such as recovered materials and waste streams, to promote efficient use of resources and reduce waste generation (Gutberlet, 2015). Additionally, Community self-management promotes innovative business models that encourage sustainable practices such as waste recovery through incentives via blockchain technology the most disadvantaged population groups (França et al., 2020; Baralla et al., 2023). Finally, community self-management in the waste sector increase awareness of individuals and communities about waste reduction, recycling, and good disposal practices. Education empowers citizens to make informed choices and actively participate in waste reduction efforts (Bhor & Ponkshe, 2018).

By summary, community self-management in the waste sector is closely aligned with the principles of circular societies of resource efficiency, closed-loop systems, local resilience, collaboration, transparency, and social innovativeness. By transforming waste into a valuable resource and minimizing its negative impacts, the Circular Society create a more sustainable and regenerative approach to waste management.

The technology sector has a significant role in promoting community self-management in the context of a Circular Society.

First, technology companies can promote community self-management by designing products with modular components and facilitating repairs and upgrades by the community (Watkins et al., 2021). This extends the life of the devices, reduces electronic waste, and decreases the need for ongoing repairs, as can be seen during the repair days organized by fab labs (Smith et., 2013; Smith et al., 2017).

The technology sector can facilitate community self-management by developing advanced e-waste management solutions (França et al., 2020). These solutions involve the responsible disposal, recycling, and recovery of electronic waste. Technologies such as automated sorting systems and specialized recycling processes (like those developed in the Turin fab lab) reduce the dependence on virgin resources (Sormunen & Kärki, 2019).

Additionally, the technological sector can stimulate the emergence of collaborative consumption models, promoting community self-management through the sharing of resources. Peer-to-peer

platforms and sharing economy apps allow people to rent, borrow, or share technology products, reducing the need for exclusive ownership, as demonstrated by the paper that analyze the different applications of the blockchain.
Moreover, the use of technology can be democratized (Fuster Morell & Espelt, 2018). Democratizing technology in a Circular Society enhances inclusiveness and enables individuals to participate in sustainable practices, fostering collaboration, innovation, and local empowerment (Patnaik & Bhowmick, 2020). By making technology accessible and enabling broader engagement, companies and fab labs can achieve their goals of resource efficiency and community-driven solutions as shown by the Turin fab lab paper (Cautela et al., 2014).
Finally, grassroots movement in the technological sector can promote community self-management by raising consumer awareness of the environmental impact of technological products (Smith, 2013). Indeed, Educational campaigns promoted by fab labs can enable consumers to make informed choices, adopt circular practices, and participate in e-waste management initiatives (Smith, 2017).
In summary, this thesis shows that the technology sector can promote community self-management in line with the characteristics of the Circular Society. It includes improving accessibility to digital technologies, democratizing technological access, promoting collaboration between stakeholders, and using these technologies to create new forms of social innovation through the adoption of sustainable circular business models.

In conclusion, this paragraph highlights the pivotal role of key sectors, including energy, food, waste, and technology, in driving the implementation of the Circular Society through community self-management. Community self-management aligns with the principles of the Circular Society of promoting resource efficiency, environmental responsibility, decentralization, collaboration, empowerment, social innovativeness, and long-term sustainability.

5.7 Summary

This chapter describes the main results of this thesis showing what are the essential elements to create a Circular Society. Indeed, this section provides a detailed overview of the ecosystem, key sectors, he role of renewable energy and new technologies in creating a society that is more sustainable, fair, and resilient.

Theoretical and managerial implications

Chapter Six

6.1 Introduction

The previous chapter outlined the main results of this thesis, offering a concise summary of the main elements necessary to create the Circular Society. Instead, this chapter focuses on the main theoretical and managerial contributions, also underlining the policy implications of the studies conducted during the doctoral path with the aim of stimulating the birth of new grassroots innovations to create the Circular Society.

6.2 Theoretical contributions: Sustainable Innovations

The papers presented in this thesis collectively contribute to the advancement of sustainable innovations field, encompassing three distinct interrelated domains: institutional innovations, eco-innovations, and social innovations (Schaltegger & Wagner, 2011). These domains offer a holistic perspective on reshaping our society towards more environmentally responsible, socially inclusive, economic models (Smith et al., 2007).

First, at the core of sustainable innovations lies the transformative potential of institutional innovations. The main contributions to this field emphasize the pivotal role of multi-stakeholder engagement, with a focus on communities in driving these changes (Seyfang et al., 2010; Hoppe et al., 2015). Recognizing the value of inclusive decision-making processes, this thesis highlights the necessity of incorporating viewpoints from policymakers, citizens, and other key stakeholders to create the Circular Society. This collaborative approach fosters an optimal environment for social innovations to reproduce redefining institutional dynamics (Smith & Stirling, 2018). By embracing multi-stakeholder engagement, this thesis broadens the horizons of management strategies enhancing their effectiveness and long-term sustainability (Gibellato et al., 2023).

Second, the discourse on sustainable innovations extends to the field of eco-innovations presenting new approaches to implement and manage natural resources to afford ecological challenges.

This collection of papers s shows the multifaceted nature of grassroots eco-innovations, where education, responsibility, technology, and new organizational models play a central role (Carrillo-Hermosilla et al., 2010; Hazarika & Zhang, 2019; Chistov, et al., 2023).

Considering diverse perspectives, from educational impacts on energy systems to blockchain's disruptive potential on natural resources management, this thesis shows the potential of a bottom-up

approach to solve environmental issues (Canwat, & Onakuse, 2022).
A focus on education's role emphasizes the power of informed citizens, capable of catalyzing innovative energy systems and positive environmental change (Gibellato et al., 2023).
The integration of responsible and ethical innovation principles aligns eco-innovations with sustainability goals, transcending mere economic growth and prioritizing holistic well-being.
As renewable energy communities and blockchain technologies gain prominence decentralized and inclusive approaches emerge democratizing energy management and waste reduction (Li et al., 2021; Graziano, & Trogal, 2023).
Finally, the discourse on sustainable innovations extends to the field of social innovations. Indeed, this thesis highlights the importance of a bottom-up approach to food, clothes, and technology in stimulating specific forms of social innovation (Graziano & Forno, 2012; Smith, 2017; Howson, 2021). Thus, this thesis shows that citizens and communities are the engines of change in the Circular Society reshaping production systems and economic direction. Indeed, the transformative potential of grassroots innovations. is paramount for addressing the complex social challenges that necessitate systemic shifts aligning with all the principles of the Circular Society (Bauwens et al, 2020).
By summary, the contributions of this thesis to the field of sustainable innovations transcend individual domains to construct a comprehensive framework for grassroots sustainable innovations. By analyzing institutional, eco, and social innovations, this thesis want to show the strategy to achieve the objectives of inclusion, communality, and social empowerment. This multidimensional perspective holds promise in creating a resilient and equitable society in harmony with the principles of the Circular Society.

6.2.1 Institutional Innovations

This collection of papers presents contributions to the domain of institutional innovations, particularly within the context of sustainable city management.
First, a significant emphasis is placed on the role of various stakeholders, especially active citizens, in driving institutional innovations. This thesis highlights the importance of inclusive decision-making processes that incorporate the perspectives of policymakers, citizens, and other key actors to create the Circular Society (Cunningham, 2017). This approach encourages a participatory and collaborative environment, fostering social innovations that reshape institutional dynamics (Kezar 2012, Ward et al., 2015). For this reason, this collection of papers contributes to the field of multi-stakeholder engagement.

Second, an alternative trajectory for achieving long-term sustainability by a bottom-up approach is proposed. Moving away from a technocratic approach, this research introduces the concept of institutional innovations driven by local communities and citizens (Geels, 2019). This perspective opens for institutional innovations that align with the needs and aspirations of urban populations (Leeuwis et al., 2021). For this reason, this thesis contributes to the field of sustainability.
Third, this collection of papers contributes to urban management studies. Indeed, the decentralized, community-driven approaches presented can lead to more effective and sustainable urban management strategies (Khmara & Kronenberg, 2020).
Fourth, this thesis contributes to the theory of system thinking. Indeed, introducing a system thinking framework supported by a multi-stakeholder analysis, this thesis promotes a new holistic understanding of institutional interactions. This reconceptualization enhances the ability to comprehend the complexities of urban governance, facilitating the identification of opportunities for innovative institutional interventions (Ha et al., 2015).
Finally, this research shed light on how institutional grassroots innovations, rooted in active citizenship, can catalyze a shift toward a society economy (Sarkar & Pansera, 2017). Indeed, by giving citizens direct control over resources, new opportunities for natural resource management can emerge.
In summary, the presented studies extend the boundaries of institutional innovations, introducing novel ways to approach resource management.

6.2.2 Eco-innovations

This collection of studies brings several contributions to the field of eco-innovations showing new approaches from the bottom for natural resource management for implementing a circular society. Indeed, considering new approaches to natural resources management using disruptive eco-innovations that follow the principles of the circular society is essential if we want to move towards new production and consumption models.
Indeed, without using these new innovative forms of natural resource management it would be impossible to create a society that follows the principles of the Circular Society. (Jaeger-Erben, 2020).
More specifically, this thesis offers a comprehensive understanding of the factors that drive disruptive eco-innovations. This thesis addresses various dimensions, such as education, responsible innovation, technology, and organizational models that fosters innovative solutions for ecological challenges in the context of the Circular Society (Durán-Romero et al., 2020).

Second, contributions encompass diverse perspectives, ranging from education's influence on energy systems to blockchain's potential for disruptive change (Swartz et al., 2017; Gibellato et al., 2023). This diversity enriches the field of eco-innovations by acknowledging the multifaceted nature of environmental issues and the need for a wide range of approaches to address them.
Third, the emphasis on education's role highlights the significance of empowered citizens (Varadarajan & Kaul, 2018). Indeed, this thesis demonstrates that education not only encourages sustainable behaviors but also stimulates the creation of innovative energy and waste management systems that empower communities (Ines et al., 2020).
Fourth, this thesis contributes to the field of responsible innovation emphasizing the importance of creating solutions that are not solely driven by economic growth but that prioritize social and environmental well-being (Jaeger-Erben, 2020; Pansera & Fressoli, 2021).
Fifth, The emphasis on renewable energy community and blockchain technologies showcases the potential of decentralized and inclusive approaches (Adu-Kankam & Camarinha-Matos, 2022; Dall-Orsoletta et al., 2022).These approaches democratize energy management, resource allocation, and waste management, allowing a broader range of stakeholders to participate and contribute to eco-innovations.
Sixth, this thesis highlight how eco-innovations can transform of socio-technical systems, governance, and economic models (Magnani & Osti, 2016, Swartz. 2017; Geels, 2019). This transformative potential is crucial for addressing complex ecological challenges that require systemic changes.
Finally, this thesis recognizes the importance of integrating environmental factors into various aspects, such as business models, policy-making, and technological advancements (Seyfang & Smith, 2007; Rizos et al., 2016; Evans et al., 2017). This integration ensures that eco-innovations consider ecological sustainability as a fundamental aspect of their implementation.
In summary, the theoretical contributions of this thesis enrich the field of eco-innovations focusing on various dimensions, approaches, and perspectives that can drive positive ecological transformations. Indeed, this collection of paper wants to encourage a holistic and inclusive view of eco-innovation that arises from the bottom. This typology of eco-innovation considers social, environmental, and economic aspects, leading to sustainable and resilient future that aligns with the principles of the Circular Society.

6.2.3 Social innovations

This thesis contributes to the field of social innovations by highlighting the potential of grassroots movements, exemplified by Solidarity Purchasing Groups and Fab/Labs Makerspaces More specifically, this thesis wants to show how grassroots innovations can be novel solutions to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society rather than private individuals. (Auerswald, 2009). Indeed, these initiatives do not simply make incremental changes to production systems but possess the transformative power to radically reshape our society (Grasseni, 2014: Smith, 2017). The essence of this transformation lies in their values of creating a society that adopts ethical consumption to achieve long-term sustainability.

According to this perspective, this thesis brings several contributions.

First. This thesis highlights the ability of social grassroots innovations to meet unmet market needs (Borzaga et al., 2016). In a world, dominated by profit-driven businesses, these initiatives fill market gaps by promoting responsible and ethical consumption (Pansera, M., & Sarkar, 2016). Indeed, grassroots innovations play a crucial role in promoting consumer awareness by pushing individuals towards more ethical consumption practices by challenging the status quo of consumerism (Hossain et al., 2018). For this reason, this thesis brings a contribution to the field of ecological economics.

Second, this collection of papers shows how grassroots social innovations can be cost-effective and accessible. Unlike many profit-focused models, initiatives like solidarity purchase groups thrive on ethical principles and voluntary efforts (Barbera et al., 2020). It highlights the idea that sustainable and ethical alternatives can also be inclusive and not financially burdensome increasing their potential for widespread adoption. For this reason, this thesis brings a contribution to the field of sustainability.

Third, this thesis shows how new organizational forms can stimulate the birth of new types of social innovations such as ecofeminist entrepreneurship (Howson, 2021). Indeed, this collection of papers shows the differences between conventional entrepreneurship and this type of social entrepreneurship giving priority to the values of equity and accessibility. Therefore, this thesis proposes a paradigm shift towards entrepreneurial forms where the main goal is to spur social and environmental well-being. For this reason, this thesis contributes to the critical management field.

Finally, this thesis shows the role of the democratization of technology in the creation of new forms of social innovation. Indeed, digital fabrication spaces, such as fab labs, democratize access to different machinery and technologies allowing citizens to engage in hands-on learning, experimentation, and innovation (Smith, 2013; Smith, 2017). This accessibility accelerates the

transition towards the circular economy, ethical innovation, and multi-stakeholder engagement, strengthening the potential for systemic change (Cramer, 2020). For this reason, this thesis contributes to the field of democratic innovations.

In summary, this thesis highlights the profound potential of grassroots social innovations in stimulating the emergence of alternative economic to reshape our societies. These innovative forms are the key for creating the Circular Society.

6.2.4 Grassroots innovations

This collection of papers contributes to the field of grassroots innovations. These contributions not only question conventional viewpoints but also offer new perspectives on how society, government, and sustainable development can be reimagined following the Circular Society's principles.

First, this thesis shows a shift in paradigms in our understanding of innovation and economic development fields (Seyfang & Smith, 2007; Hossein, 2016; Pansera, & Fressoli, 2021). Traditionally, innovation has been strongly associated with technological advances driven by corporations and research institutions. However, this thesis challenges this view, presenting grassroots innovations as powerful catalysts for change. Indeed, the different studies show how local communities, often marginalized, can develop solutions to their challenges, contributing to the innovation field (Seyfang, G., & Longhurst 2013; Suriyankietkaew, et al., 2020). This shift calls for a more inclusive definition of innovation that encompasses community-driven creativity, highlighting the richness of knowledge and ideas that emerge from the bottom. For this reason, this thesis contributes to the field of democratic innovations (Smith, 2017; & Fressoli, 2021).

Second, this thesis shows the importance of active citizenship and participatory governance as driving forces for realizing the Circular Society (Seyfang. 2010; Gutberlet, 2018). This thesis shows the importance of bottom-up decision-making underlining the importance of involving citizens in decision-making processes to shape their communities to achieve long-term sustainability.

Indeed, this thesis introduces the concept of co-creation, where citizens are actively engaged in solving problems by contributing to the development of innovative solutions (Tesfaye & Fougère, 2022).

Third, this thesis contributes to the field of natural resource management. Indeed, this thesis reveals how grassroots innovations democratize access of natural resources and allow citizens to directly manage part of the production processes (Boni et al., 2019). For example, by utilizing the

blockchain to efficiently manage resources and waste from the bottom, new technologies promote a multi-stakeholder engagement in natural resources management. This concept challenges the dominant capitalist economy and envisions a future where communities take control of their resources and minimize environmental impacts (Swartz, 2017).

Fourth, this thesis contributes to the field of smart cities. Indeed, this thesis shows a new model of cities where urban spaces are used to create social innovations and eco-innovations (Smith, A. 2011; Longhurst & Chilvers, 2019). Therefore, this collection of papers shows that the cities of the future should not be only technology-driven but should prioritize the well-being of their citizens and the responsible use of resources through the diffusion of grassroots innovations. Indeed, Grassroots innovations play a pivotal role in this transformation by advocating for inclusive and participatory urban development that enhances both the quality of life and environmental resilience (Childers et al., 2015; Ortiz & Peris, 2022).

Finally, this thesis redefines the concepts of progress and well-being contributing to the fields of ecological economics and Degrowth. Indeed, this collection of papers challenges the traditional indicators of well-being by proposing a broader framework that includes social equity, environmental sustainability, and community resilience. This perspective advocates for a holistic understanding of progress that integrates various dimensions of human development where grassroots innovations play a central role (Martin et al., 2020).

In conclusion, this thesis challenges the concepts of innovation, governance, and social progress. By highlighting the role of active citizenship for natural resource management and social innovativeness through the democratization of technology, this collection of papers shows how grassroots innovations can create the preconditions for a more inclusive, sustainable, and participatory society.

6.2.5 Knowledge management and intellectual capital

The Circular Society model brings several theoretical contributions to the fields of knowledge management and intellectual capital. These contributions emphasize the importance of integrating sustainability, social well-being, and economic considerations into knowledge management and intellectual capital fields.

First, the Circular Society model underscores the need for sustainability in economic, social, and environmental dimensions. This integration requires knowledge management systems to incorporate information about sustainable practices, circular economy principles, and the environmental and social impacts of decisions. This expands the scope of knowledge management beyond traditional

economic considerations (Secundo et al., 2020).

Second, the Circular Society emphasizes circular literacy, which involves holistic thinking and understanding natural cycles. The theoretical contribution lies in advocating for holistic knowledge approaches within knowledge management. This involves recognizing the interconnectedness of economic, social, and environmental factors and managing knowledge in a way that reflects this interconnectedness (Chopra et al., 2021).

Third, circular literacy, as highlighted by the Circular Society model, becomes a core component. From this perspective, this paper's collection recognizes the importance of educating individuals and communities about circular principles, sustainable practices, and systemic thinking. This leads to the development of knowledge management strategies that prioritize circular literacy to drive sustainable decision-making (Deng et al., 2023).

Fourth, the Circular Society model calls for democratization not only in decision-making but also in access to knowledge. For this reason, this thesis shows that knowledge management can promote equal access to information, education, and best practices. This inclusiveness ensures that diverse stakeholders can contribute to and benefit from knowledge processes, aligning with the democratization principles of the Circular Society (Santoro et al., 2018).

Fifth, collaboration is a key principle of the Circular Society. For this reason, this thesis shows that knowledge management can promote innovative collaboration platforms. These platforms should facilitate the exchange of knowledge, ideas, and best practices among stakeholders from different sectors. The emphasis is on building interdisciplinary collaborations to address complex challenges related to sustainability and social well-being (Pesce et al., 2020).

Sixth, the Circular Society model promotes empowerment through knowledge sharing, emphasizing the importance of providing individuals with the skills and information needed to actively participate in sustainable practices. Developing knowledge management strategies that empower individuals and communities is essential by facilitating access to relevant information, training, and educational resources (Atiku et al., 2020).

Seventh, the Circular Society model introduces the concept of multi-dimensional progress measures that go beyond monetary value. Therefore, this thesis shows that knowledge management can support the development of metrics and indicators that assess progress in economic, social, and environmental dimensions. This requires knowledge management systems to evolve to capture and analyze diverse forms of data related to these dimensions (Bougoulia & Glykas, M. (2023).

Eighth, intellectual capital is not only acknowledged in economic terms but also recognized for its role in driving social innovation within the Circular Society model. Therefore, this thesis expands the concept of intellectual capital to encompass the knowledge, skills, and innovative thinking

needed for social and environmental advancements (Zambon, S., & Monciardini, 2015).
In summary, the Circular Society model contributes theoretically to knowledge management and intellectual capital by advocating for holistic, sustainable, and inclusive approaches. It highlights the interconnectedness of economic, social, and environmental factors, and underscores the role of knowledge in driving positive change toward a more resilient and environmentally conscious society-

6.3 Managerial contributions

6.3.1 Multi-stakeholder engagement

The ten documents presented underline the importance of adopting a multi-stakeholder engagement to afford sustainability challenges and to spur new innovative forms. Indeed, to achieve long-term sustainability, it is necessary to move away from traditional top-down approaches, urging stakeholders to converge their perspectives, skills, and resources for the collective improvement of society. The creation of grassroots entrepreneurial ecosystems is essential to stimulate the emergence of new innovative forms of resource management. For instance, to create renewable energy communities is crucial in promoting collaborative environments in which citizens, entrepreneurs, educational institutions, government bodies, and businesses come together synergistically to achieve long-term sustainability goals. These ecosystems transcend the boundaries of institutional and educational business worlds inspiring a cross-fertilization of ideas that start from the community to creating innovative solutions to solve complex challenges. Furthermore, this thesis underlines the central role of technologies and policies that strengthen and incentivize the involvement of multiple stakeholders in initiatives such as disruptive eco-innovations. Through the creation of multi-stakeholder models, the thesis underlines the importance of government support in fostering projects that involving various stakeholders, especially those at the grassroots level. Such policies cultivate an enabling environment that allows stakeholders to actively participate in the co-creation of sustainable innovations, amplifying their sense of ownership and responsibility. Central to these contributions is the awareness that multi-stakeholder engagement not only enriches innovation processes but also amplifies the impact of the resulting solutions. Collaboration between stakeholders with differing viewpoints and expertise leads to more comprehensive problem-solving, thus improving the quality and relevance of results. This inclusive approach also facilitates the equitable distribution of benefits, ensuring that innovations meet the needs of communities and disadvantaged stakeholders.
In summary, from a managerial point of view, multi-stakeholder engagement is a strategic

imperative in the pursuit of circular societies and in the realization of grassroots innovations. This approach not only promotes innovative new forms but also builds bridges between government entities, businesses, communities, and individuals fostering a sense of shared responsibility in shaping a more sustainable future. As this thesis shows insights to real-world examples, these papers provide policymakers, entrepreneurs, researchers, and the tools needed to foster collaborative ecosystems, driving the transition toward an equitable and resilient society.

6.3.2 New organizational forms

The ten papers presented in the context of Circular Society reveal a transformative paradigm shift toward new organizational forms. This thesis offers insights into both the characteristics of new organizations and how these organizations can promote long-term sustainability and social progress. This collection of studies highlights how traditional models can be reinvented, giving rise to innovative organizational forms that favor collaboration, inclusiveness, and equity.

The main organizational models studied are energy communities, Fab Labs, solidarity purchasing groups, and community waste management. These organizations transcend conventional profit-oriented motivations, aiming to create value that goes beyond economic parameters.

Instead, they emphasize the fusion of economic, social, and environmental considerations aligning with the principles of the Circular Society. These organizational models are often community-driven, driven by shared values and aspirations, and designed to address specific social challenges. Furthermore, these new organizational forms promote participatory engagement among different stakeholders. By embracing open innovation and co-creation, these organizations draw on the collective intelligence of communities. This collaborative ethos increases the potential of bottom-up innovations to address complex and interconnected challenges and to generate sustainable solutions to solve local needs.

Therefore, one of the objectives of this thesis is to show the characteristics of these organizational forms and to stimulate their growth within our society.

Furthermore, this thesis highlights the potential of new organizational forms to drive policy innovation. These organizations often need supportive regulatory frameworks and incentives. Policymakers are encouraged to proactively design policies that allow these models to grow and reproduce by aligning them with broader social and environmental goals.

Furthermore, even classic business models can draw inspiration from these innovative models, adopting principles of shared value creation, environmental protection, and social responsibility.

In conclusion, these new organizational forms in the context of the Circular Society inspire a move away from traditional hierarchical structures, inviting citizens, entrepreneurs, and policymakers to embrace collaborative models based on values that amplify social and environmental impact.

Organizational models	**Literature**	**Main Characteristics**
Renewable energy communities	(Ambole et al., 2021); (Berthod et al., 2023); (Chantrel et al., 2021); (Gunderson et al., 2018); (Hussain et al., 2022); (Kunze & Becker, 2015); (Rommel, et al., 2018); (Šahović & Da Silva, 2016); (Savelli & Morstyn, 2021); (Wahlund & Palm, 2022)	1. Decentralized 2. Renewable 3. Community-driven 4. Localized 5. Sustainable 6. Empowering 7. Collaborative 8. Resilient 9. Inclusive 10. Self-sufficient
Fab Labs/makerspaces	(Kohtala, 2016); (Kohtala, 2017); (Manzo & Ramella,2015); (Maravilhas & Martins, 2019); (Smith, et al., 2013); (Smith, 2017); (Smith, 2017); (Troxler & Wolf, 2010); (Van Holm, 2015)	1. Digital fabrication 2. Open access 3. Innovation 4. Collaboration 5. Creativity 6. Community 7. Hands-on 8. Prototyping 9. DIY (Do It Yourself) 10. Maker culture
Solidarity Purchasing Groups	(Baldi et al., 2019); (Brunori et al., 2012); (Cattivelli & Rusciano, 2020); (Fonte et al., 2013); (Grasseni, et al., 2014); (Graziano & Forno, 2012); (Loh & Shear, 2019); (Medici, et al., 2012)	1. Local 2. Cooperative 3. Sustainable 4. Voluntary 5. Community-driven 6. Zero-kilometer 7. Collective 8. Ethical 9. Direct relationship 10. Affordable
Communitarian waste management	(França, et al., 2020); (Gutberlet et al., 2020); (Gutberlet, 2021); (Kumar & Agrawal, 2020); (Randhawa et al., 2020); (Sultana et al., 2021)	1. Collaborative 2. Local 3. Circular 4. Sustainable 5. Inclusive 6. Transparent 7. Resourceful 8. Community-driven 9. Responsible 10. Waste reduction

Table 9: Main organizational models for the Circular Society

Source: our elaboration

6.4 Policy Implications

6.4.1 Socio-technical niches

This thesis offers insights into the policy implications for the realization of a Circular Society. These implications reflect the recognition of the central role of institutions in supporting the implementation and diffusion of grassroots innovations.

More specifically, the concept of socio-technical niches highlights the importance of creating environments that facilitate the emergence and diffusion of this type of innovation. Indeed, these niches provide the preconditions in which unconventional and bottom-up innovations can evolve and demonstrate their potential to address complex social challenges.

Policymakers play a proactive role in promoting such niches, recognizing that they are essential incubators for cultivating new solutions that may initially operate outside traditional norms.

In fact, given that grassroots innovations are innovative forms that hide outside the market, they often struggle to spread for two main reasons.

First, these innovations do not appear to be competitive with those on the market. For this reason, to spread they require economic support from institutions through forms of financing to protect them from innovations that arise on the market. Secondly, these innovative forms, born in informal contexts, often lack a regulatory framework and are therefore illegal. For this reason, recognizing their value, institutions must create ad hoc laws that allow the diffusion of these innovative forms.

Therefore, policymakers have to find delicate a balance between providing sufficient space for experimentation within socio-technical niches and establishing a regulatory framework that safeguards public interest and safety. This balance requires policymakers to adopt adaptive and flexible approaches that can adapt to the evolutionary nature of grassroots innovations. In conclusion, the policy implications regarding the creation of socio-technical niches highlight the need for institutions to create the conditions in which grassroots innovations can thrive.

By designing policies that encourage experimentation, collaboration, and knowledge sharing, policymakers can stimulate the growth of grassroots innovations that contribute significantly to the creation of the Circular Society. These interventions require an agile and responsive decision-making approach that embraces uncertainty while safeguarding social interests, fostering an ecosystem where grassroots initiatives can thrive and drive social change.

6.4.2 European funding and international cooperation

This paper's collection underscores that grassroots innovations represent a distinct category within social innovations. It is crucial to acknowledge how specific programs within the European Union (EU) and other supranational entities can actively promote grassroots innovations, aligning with existing EU initiatives dedicated to social innovations.

This research highlights the importance of supporting the birth of grassroots innovations through EU funding programs and international cooperation. Therefore, financial support and collaborative partnerships play pivotal roles in expediting the influence of grassroots innovations.

European funding, such as those under the Horizon Europe program, emerges as a crucial instrument in catalyzing and sustaining grassroots innovations. Policymakers are urged to design targeted funding programs, drawing inspiration from existing EU frameworks, tailored to the unique characteristics of these innovations. Such programs should prioritize inclusivity, flexibility, and affordability, ensuring a wide array of grassroots projects giving financial support especially those with transformative and replicable potential.

Moreover, this thesis underscores the importance of aligning EU funding programs with the principles of the Circular Society. For example, initiatives like the European Green Deal can serve as a framework for supporting projects emphasizing innovative resource management and the democratization of technologies, aligning with the Circular Society's overarching objectives.

Additionally, International cooperation, as facilitated by EU programs like Horizon Europe's international partnerships, remains indispensable for promoting socio-technical niches that promote grassroots innovations on a broader scale. Cross-border collaboration, supported by EU initiatives, facilitates the exchange of best practices and lessons from successful policy models that have fueled grassroots innovation. This cooperation can give rise to collaborative platforms supported by EU funding programs that enhance ecosystems conducive to this type of innovation.

Furthermore, this thesis emphasizes the significance of fostering networks that connect grassroots innovators, policymakers, and funding entities, potentially leveraging EU programs such as COSME for SMEs. These networks streamline information sharing, enhance transparency, and boost the visibility of high-impact initiatives. Policymakers, with support from EU initiatives, play a crucial role in facilitating these networks, ensuring that grassroots innovators not only have access to financial resources but also to expertise, mentorship, and collaboration opportunities.

In conclusion, this thesis underscores the importance of supporting the birth of grassroots innovation through EU funding programs and international cooperation, such as those within Horizon Europe and the European Green Deal, that could serve as strategic mechanisms to realize the objectives of the Circular Society. Policymakers, by leveraging existing EU frameworks and

programs, can magnify the impact of grassroots innovations, expedite their development, and contribute to the establishment of an equitable and resilient future.

6.5 Summary

This chapter shows the main theoretical and managerial contributions and policy implications. Indeed, this chapter shows how this thesis contributes to the sustainable innovation field by showing new innovative and organizational forms.
Furthermore, this chapter shows how it is necessary to implement multi-stakeholder engagement if communities want to promote new innovative and organizational forms. Furthermore, the creation of specific socio-technical niches and the support of European funding with the objectives of stimulating grassroots innovations are essential for creating the Circular Society.

7 Conclusions and limitations

Chapter Seven

7.1 Introduction

The previous chapter outlined the contributions of this thesis by analyzing the main theoretical, managerial contributions, and political implications of this thesis.

Instead, this chapter summarizes the key results, the main limitations, and the future lines of research to try to stimulate the creation of a circular society.

7.2 Summary of key results and insights

This collection of papers explores the intersection between the Circular Society and grassroots innovations, presenting key concepts and findings that highlight the transformative potential of grassroots innovations and new organizational forms in implementing the Circular Society principles. These principles challenge traditional profit-focused approaches, promote responsible resource management, encourage community-centered initiatives, and emphasize the importance of multi-stakeholder management in achieving long-term sustainability goals. Indeed, this thesis underlines the importance of collaboration, democratization of technology, and inclusiveness in shaping a more resilient and equitable future.

Through insights on new organizational forms and local grassroots practices, this thesis contributes to the field of sustainable innovations showing how alternative approaches can reshape the entrepreneurial landscape and contribute to a more socially and environmentally conscious society.

More specifically, the thesis explores the issue of ecological economics showing how new organizational forms such as energy communities, ecofeminist entrepreneurship, and Fab Labs, can promote less impactful and more ethical consumption models. This challenges conventional profit maximization approaches and promotes the integration of social and environmental considerations within various organizational forms.

Second, this thesis underlines the importance of the principles of the Circular Society, which give priority to the accessibility of resources toward the empowerment of citizens.

More specifically, the empowerment of individuals and communities plays a central role, fostering participatory decision-making through democratization of innovation.

Grassroots initiatives prioritize worker and citizen empowerment, ethical values, and shared responsibility, aligning with the Circular society principles.

Third, this thesis showcases the importance of technology including artificial intelligence and blockchain in creating the Circular Society. Indeed, these technologies play a fundamental role in the transition from classic business models to those that can arise within the Circular Society.
Fourth, this thesis shows that to achieve long-term sustainability it is necessary to create collaborative models that involve various stakeholders, including governments, businesses, communities, and citizens. Citizens are the engine for creating grassroots innovations that want to solve local problems Fifth, a multi-stakeholder engagement leverages different perspectives and resources to find more effective solutions to sustainability issues.
Sixth, this thesis underlines the importance of institutions to create socio-technical niches, which provide spaces for experimentation and dissemination of grassroots innovations. These niches allow unconventional ideas to flourish and suggest the need for policies that encourage risk-taking and unconventional approaches to problem-solving.
Finally, this thesis highlights the role of European funding programs in disseminating grassroots innovations to have a wider impact on society through replication or scaling-up. Hence, this thesis wants to stimulate policymakers to design funding mechanisms in line with the principles of Circular Society promoting cross-border collaboration for knowledge sharing among different communities.
In conclusion, this thesis underlines the potential of Circular Society and grassroots innovations to challenge traditional business norms, promote sustainable practices, and reshape organizational structures to afford big changes in production and consumption patterns. Indeed. this thesis underlines the importance of collaborative engagement, ethical considerations, and innovative bottom-up approaches to achieve a more sustainable and socially aware future.

7.3 Conclusions, Main limitations and, future direction of research

This thesis has some main limitations that need further exploration.
The first limitation is that many of the papers presented are theoretical or conceptual which require empirical validation to validate the results. This implies that in the future researchers will have to empirically assess the theories shown by the conceptual papers.
The second limitation of this thesis is the impossibility of generalizing the results to every context (from developed countries to developing countries) because the case studies presented focus on specific social contexts. While these localized studies are essential, expanding this research across multiple case studies and quantitative research to encompass different scenarios can provide a more holistic understanding improving the transferability of findings.

In summary, these limitations underline the need to implement other research methodologies and broaden contextual considerations to make the results more generalizable. Addressing these limitations will be necessary to strengthen the already valuable contributions of this thesis advancing the collective understanding of how to achieve the Circular Society through the democratization of innovation and through social transformation.

Moreover, this thesis seeks to delineate the main characteristics of the circular society, along with the key innovative forms, organizational structures, and the general context essential for its realization. However, given the novelty of this subject, forthcoming research endeavors should concentrate on aspects not covered in this thesis to comprehensively explore the intricacies of this emerging social model.

First, future researchers should deepen the topic of how to implement ethical business models across industries and regions. Investigating the challenges and barriers faced by businesses and new organizational forms in integrating ethical practices, will be necessary to create the Circular Society.

Second, future researchers should explore the dynamics and success factors of emerging organizational forms, such as ecofeminist entrepreneurship and Fab Labs. Investigating how these models can be adapted to different cultural and socioeconomic contexts and examining the challenges and strategies for sustaining these organizations will be essential to understanding the feasibility of creating a Circular Society.

Third, researchers will have to study effective strategies that allow governments, businesses, communities, and citizens to align their interests in a way to overcome conflicts, and collectively drive sustainable change following the principles of the Circular Society.

Fourth, future researchers should focus on designing and nurturing socio-technical niches to create the necessary preconditions for the creation of the Circular Society. Exploring how policymakers can create supportive environments that encourage experimentation, risk-taking, and unconventional problem-solving and investigating the role of education, training, and mentorship in nurturing individuals and initiatives within these niches will be essential for creating the Circular Society.

Fifth, future researchers have to explore how international collaboration can stimulate grassroots innovations by understanding what funding can be useful for financing these innovative forms.

Sixth, future researchers should develop robust methodologies to measure the social, environmental, and economic impact of grassroots innovations in the context of the Circular Society. Although our society can obtain benefits from the implementation of grassroots innovations, it is necessary to develop metrics that highlight their value to compare the Circular society with other development models. For this reason, the quintuple helix framework can be used to classify the grassroots entrepreneurial ecosystem discussed in Chapter 2. Nonetheless, to enhance the evaluation process

relating to the social context and specific innovative forms, it is essential to extend the assessment metrics and deepen the analysis using specific Key Performance Indicators (KPIs) to identify deemed significant variables from economic, social, and environmental perspectives.

Finally, future researchers should examine strategies that encourage behavioral change among consumers and businesses toward the principles of the Circular Society. Indeed, it is necessary to Investigate how to effectively communicate the benefits of grassroots initiatives to different target audiences to develop a society that follows the principles promoted by Jaeger-Erben et al.

In conclusion, future researchers' directions should analyze different contexts using different methodological approaches to understand in detail whether and where it is possible to create a society that follows the principles of the Circular Society.

Therefore, future research directions should address challenges, explore opportunities, and provide insights to guide policymakers, researchers, and practitioners to realize the Circular Society.

References

Adu-Kankam, K. O., & Camarinha-Matos, L. M. (2022). Renewable energy communities or ecosystems: An analysis of selected cases. *Heliyon*.

Aguilar, J., Garces-Jimenez, A., R-moreno, M. D., & García, R. (2021). A systematic literature review on the use of artificial intelligence in energy self-management in smart buildings. *Renewable and Sustainable Energy Reviews*, *151*, 111530.

Ahlstrom, D., Arregle, J. L., Hitt, M. A., Qian, G., Ma, X., & Faems, D. (2020). Managing technological, sociopolitical, and institutional change in the new normal. *Journal of Management Studies*, *57*(3), 411-437.

Akenji, L. (2014). Consumer scapegoatism and limits to green consumerism. *Journal of Cleaner Production*, *63*, 13-23.

Allam, Z., & Dhunny, Z. A. (2019). On big data, artificial intelligence and smart cities. *Cities*, *89*, 80-91.

Altieri, M. A., & Toledo, V. M. (2011). The agroecological revolution in Latin America: rescuing nature, ensuring food sovereignty, and empowering peasants. *Journal of peasant studies*, *38*(3), 587-612.

Alvesson, M., Bridgman, T., & Willmott, H. (Eds.). (2009). *The Oxford handbook of critical management studies*. Oxford Handbooks Online.

Ambole, A., Koranteng, K., Njoroge, P., & Luhangala, D. L. (2021). A review of energy communities in sub-saharan Africa as a transition pathway to energy democracy. *Sustainability*, *13*(4), 2128.

Amorim de Oliveira, Í. (2021). Environmental justice and circular economy: Analyzing justice for waste pickers in upcoming circular economy in Fortaleza, Brazil. *Circular Economy and Sustainability*, *1*(3), 815-834.

Angelidou, M., & Psaltoglou, A. (2017). An empirical investigation of social innovation initiatives for sustainable urban development. *Sustainable cities and society*, *33*, 113-125.

Asara, V., Otero, I., Demaria, F., & Corbera, E. (2015). Socially sustainable degrowth as a social–ecological transformation: repoliticizing sustainability. *Sustainability Science*, *10*, 375-384.

Atiku, S. O. (2020). Knowledge management for the circular economy. In *Handbook of research on entrepreneurship development and opportunities in circular economy* (pp. 520-537). IGI Global.

Avelino, F., Dumitru, A., Cipolla, C., Kunze, I., & Wittmayer, J. (2022). Translocal empowerment in transformative social innovation networks. In *The economics of social innovation* (pp. 103-125). Routledge.

Badley, G. (2009) 'Publish and be doctor-rated: The PhD by published work', *Quality Assurance in Education: An International Perspective*, 17(4), 331-342.

Baldi, L., Bertoni, D., Migliore, G., & Peri, M. (2019). How alternative food networks work in a metropolitan area? An analysis of Solidarity Purchase Groups in Northern Italy. *Agricultural and Food Economics*, *7*(1), 1-21.

Banerjee, S. B., Jermier, J. M., Peredo, A. M., Perey, R., & Reichel, A. (2021). Theoretical perspectives on organizations and organizing in a Degrowth era. *Organization*, *28*(3), 337-357.

Baralla, G., Pinna, A., Tonelli, R., & Marchesi, M. (2023). Waste management: A comprehensive state of the art about the rise of blockchain technology. *Computers in Industry*, *145*, 103812.

Barbera, F., Dagnes, J., & Di Monaco, R. (2020). Participation for what? Organizational roles, quality conventions and purchasing behaviors in solidarity purchasing groups. *Journal of Rural Studies*, *73*, 243-251.

Bauhardt, C. (2014). Solutions to the crisis? The Green New Deal, Degrowth, and the Solidarity Economy: Alternatives to the capitalist growth economy from an ecofeminist economics perspective. *Ecological economics*, *102*, 60-68.

Bauwens, T., Hekkert, M., & Kirchherr, J. (2020). Circular futures: what will they look like? *Ecological Economics*, *175*, 106703.

Bauwens, T., Schraven, D., Drewing, E., Radtke, J., Holstenkamp, L., Gotchev, B., & Yildiz, Ö. (2022). Conceptualizing community in energy systems: A systematic review of 183 definitions. *Renewable and Sustainable Energy Reviews*, *156*, 111999.

Becerra, L., Carenzo, S., & Juarez, P. (2020). When circular economy meets inclusive development. Insights from urban recycling and rural water access in Argentina. *Sustainability*, *12*(23), 9809.

Bell, S. E., Daggett, C., & Labuski, C. (2020). Toward feminist energy systems: Why adding women and solar panels is not enough. *Energy research & social science*, *68*, 101557.

Berthod, O., Blanchet, T., Busch, H., Kunze, C., Nolden, C., & Wenderlich, M. (2023). The rise and fall of energy democracy: 5 cases of collaborative governance in energy systems. *Environmental Management*, *71*(3), 551-564.

Bhor, G., & Ponkshe, S. (2018). A decentralized and sustainable solution to the problems of dumping menstrual waste into landfills and related health hazards in India. *European Journal of Sustainable Development*, *7*(3), 334-334.

Biggs, R., Westley, F. R., & Carpenter, S. R. (2010). Navigating the back loop: fostering social innovation and transformation in ecosystem management. *Ecology and society*, *15*(2).

Bocken, N. M., & Short, S. W. (2021). Unsustainable business models–Recognising and resolving institutionalised social and environmental harm. Journal of Cleaner Production, 312, 127828.

Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of cleaner production*, *65*, 42-56.

Boni, A., López-Fogués, A., Fernández-Baldor, Á., Millan, G., & Belda-Miquel, S. (2019). Initiatives towards a participatory smart city. The role of digital grassroots innovations. *Journal of global ethics*, *15*(2), 168-182.

Bonomi, A., Della Puppa, F., & Masiero, R. (2016). *La società circolare: fordismo, capitalismo molecolare, sharing economy*. DeriveApprodi.

Borzaga, C., Fazzi, L., & Galera, G. (2016). Social enterprise as a bottom-up dynamic: part 1. The reaction of civil society to unmet social needs in Italy, Sweden, and Japan. *International Review of Sociology*, *26*(1), 1-18.

Bougoulia, E., & Glykas, M. (2023). Knowledge management maturity assessment frameworks: A proposed holistic approach. *Knowledge and Process Management*, *30*(4), 355-386.

Brand-Correa, L., Brook, A., Büchs, M., Meier, P., Naik, Y., & O'Neill, D. W. (2022). Economics for people and planet—moving beyond the neoclassical paradigm. *The Lancet Planetary Health*, *6*(4), e371-e379.

Brunori, G., Rossi, A., & Guidi, F. (2012). On the new social relations around and beyond food. Analysing consumers' role and action in Gruppi di Acquisto Solidale (Solidarity Purchasing Groups). *Sociologia ruralis*, *52*(1), 1-30.

Buechler, S., Hanson, A. M., Liverman, D., & Gay-Antaki, M. (2015). Advancing multi-disciplinary scholarship on gender, water, and environmental change through feminist political ecology. *A political ecology of women, water, and global environmental change*, *15*, 199-214.

Buhl, A., Blazejewski, S., & Dittmer, F. (2016). The more, the merrier: Why and how employee-driven eco-innovation enhances environmental and competitive advantage. *Sustainability*, *8*(9), 946.

Calisto Friant, M., Reid, K., Boesler, P., Vermeulen, W. J., & Salomone, R. (2023). Sustainable circular cities? Analysing urban circular economy policies in Amsterdam, Glasgow, and Copenhagen. Local Environment, 1-39.

Calzada, I. (2019). Local entrepreneurship through a multi-stakeholder ' tourism living lab in the post-violence/peripheral era in the Basque Country. *Regional Science Policy & Practice*, *11*(3), 451-466.

Campos, I., & Marín-González, E. (2020). People in transitions: Energy citizenship, prosumerism and social movements in Europe. *Energy Research & Social Science*, *69*, 101718.

Cantarero, M. M. V. (2020). Of renewable energy, energy democracy, and sustainable development: A roadmap to accelerate the energy transition in developing countries. *Energy Research & Social Science*, *70*, 101716.

Canwat, V., & Onakuse, S. (2022). Organic agriculture: A fountain of alternative innovations for social, economic, and environmental challenges of conventional agriculture in a developing country context. *Cleaner and Circular Bioeconomy*, *3*, 100025.

Carley, S., Engle, C., & Konisky, D. M. (2021). An analysis of energy justice programs across the United States. *Energy Policy*, *152*, 112219.

Carrillo-Hermosilla, J., Del Río, P., & Könnölä, T. (2010). Diversity of eco-innovations: Reflections from selected case studies. *Journal of cleaner production*, *18*(10-11), 1073-1083.

Cattivelli, V., & Rusciano, V. (2020). Social innovation and food provisioning during COVID-19: The case of urban–rural initiatives in the province of Naples. *Sustainability, 12*(11), 4444.

Cautela, C., Pisano, P., & Pironti, M. (2014). The emergence of new networked business models from technology innovation: an analysis of 3-D printing design enterprises. *International Entrepreneurship and Management Journal*, *10*, 487-501.

Celata, F., & Sanna, V. S. (2019). A multi-dimensional assessment of the environmental and socioeconomic performance of community-based sustainability initiatives in Europe. *Regional environmental change*, *19*, 939-952.

Cembalo, L., Migliore, G., & Schifani, G. (2013). Sustainability and new models of consumption: The solidarity purchasing groups in Sicily. *Journal of agricultural and environmental ethics*, *26*, 281-303.

Chantrel, S. P., Surmann, A., Erge, T., & Thomsen, J. (2021). Participative Renewable Energy Community—How Blockchain-Based Governance Enables a German Interpretation of RED II. *Electricity*, *2*(4), 471-486.

Charles, G. (2021). Sustainability of social enterprises involved in waste collection and recycling activities: Lessons from Tanzania. *Journal of Social Entrepreneurship*, *12*(2), 219-237.

Chavez-Miguel, G., Bonatti, M., Ácevedo-Osorio, Á., Sieber, S., & Löhr, K. (2022). Agroecology as a grassroots approach for environmental peacebuilding: Strengthening social cohesion and resilience in post-conflict settings with community-based natural resource management. *GAIA-Ecological Perspectives for Science and Society, 31*(1), 36-45.

Chen, J., Han, L., & Qu, G. (2020). Citizen innovation: Exploring the responsibility governance and cooperative mode of a "post-schumpeter" paradigm. *Journal of Open Innovation: Technology, Market, and Complexity*, *6*(4), 172.

Childers, D. L., Cadenasso, M. L., Grove, J. M., Marshall, V., McGrath, B., & Pickett, S. T. (2015). An ecology for cities: A transformational nexus of design and ecology to advance climate change resilience and urban sustainability. *Sustainability*, *7*(4), 3774-3791.

Chistov, V., Carrillo-Hermosilla, J., & Aramburu, N. (2023). Open eco-innovation. Aligning cooperation and external knowledge with the levels of eco-innovation radicalness. *Journal of Open Innovation: Technology, Market, and Complexity*, *9*(2), 100049.

Chopra, M., Saini, N., Kumar, S., Varma, A., Mangla, S. K., & Lim, W. M. (2021). Past, present, and future of knowledge management for business sustainability. *Journal of Cleaner Production*, *328*, 129592.

Clube, R. K., & Tennant, M. (2023). What would a human-centred 'social'Circular Economy look like? Drawing from Max-Neef's Human-Scale Development proposal. Journal of Cleaner Production, 383, 135455.

Cockburn, J., Cundill, G., Shackleton, S., & Rouget, M. (2018). Towards place-based research to support social–ecological stewardship. *Sustainability, 10*(5), 1434.

Cohen, B., & Muñoz, P. (2015). Toward a theory of purpose-driven urban entrepreneurship. *Organization & Environment*, *28*(3), 264-285.

Connors, P., & McDonald, P. (2011). Transitioning communities: community, participation, and the Transition city movement. *Community development journal*, *46*(4), 558-572.

Costanza, R., Cumberland, J. H., Daly, H., Goodland, R., & Norgaard, R. B. (1997). *An introduction to ecological economics*. CRC Press.

Costanza, R., d'Arge, R., De Groot, R., Farber, S., Grasso, M., Hannon, B., ... & Van Den Belt, M. (1997). The value of the world's ecosystem services and natural capital. *nature*, *387*(6630), 253-260.

Counihan, C. (2018). *Italian food activism in urban Sardinia: place, taste, and community*. Bloomsbury Publishing.

Cramer, J. M. (2020). The function of transition brokers in the regional governance of implementing circular economy—A comparative case study of six Dutch regions. *Sustainability*, *12*(12), 5015.

Crowley, D., Marat-Mendes, T., Falanga, R., Henfrey, T., & Penha-Lopes, G. (2021). Towards a necessary regenerative urban planning. Insights from community-led initiatives for ecocity transformation. *Cidades. Comunidades e Territórios*, (Sp21).

Dall-Orsoletta, A., Cunha, J., Araújo, M., & Ferreira, P. (2022). A systematic review of social innovation and community energy transitions. *Energy Research & Social Science*, *88*, 102625.

Daly, H. E. (1991). *Steady-state economics: with new essays*. Island press.

Davies, R. and Rolfe, G. (2009) 'PhD by Publication: A prospective as well as retrospective award? Some subversive thoughts,' *Nurse Education Today*, 29, 590-594.

De Jesus, A., & Mendonça, S. (2018). Lost in transition? Drivers and barriers in the eco-innovation road to the circular economy. *Ecological economics*, *145*, 75-89.

Del Giudice, M., Scuotto, V., Ballestra, L. V., & Pironti, M. (2022). Humanoid robot adoption and labour productivity: a perspective on ambidextrous product innovation routines. The International Journal of Human Resource Management, 33(6), 1098-1124.

Del Giudice, M., Scuotto, V., Orlando, B., & Mustilli, M. (2023). Toward the human–centered approach. A revised model of individual acceptance of AI. Human Resource Management Review, 33(1), 100856.

Deng, H., Duan, S. X., & Wibowo, S. (2023). Digital technology driven knowledge sharing for job performance. *Journal of Knowledge Management*, *27*(2), 404-425.

Dias, J., & Partidário, M. (2019). Mind the gap: The potential transformative capacity of social innovation. *Sustainability*, *11*(16), 4465.

Dodds, S. (1997). Towards a 'science of sustainability': Improving the way ecological economics understands human well-being. *Ecological economics*, *23*(2), 95-111.

Dudek, M., & Wrzaszcz, W. (2020). On the way to eco-innovations in agriculture: Concepts, implementation, and effects at national and local level. The case of Poland. *Sustainability*, *12*(12), 4839.

Durán-Romero, G., López, A. M., Beliaeva, T., Ferasso, M., Garonne, C., & Jones, P. (2020). Bridging the gap between circular economy and climate change mitigation policies through eco-innovations and Quintuple Helix Model. *Technological Forecasting and Social Change*, *160*, 120246.

Dyck, B., & Silvestre, B. S. (2018). Enhancing socio-ecological value creation through sustainable innovation 2.0: Moving away from maximizing financial value capture. *Journal of cleaner production*, *171*, 1593-1604.

Echefaj, K., Charkaoui, A., Cherrafi, A., Garza-Reyes, J. A., Khan, S. A. R., & Chaouni Benabdellah, A. (2023). Sustainable and resilient supplier selection in the context of circular economy: an ontology-based model. Management of Environmental Quality: An International Journal, 34(5), 1461-1489.

Edwards-Schachter, M. (2018). The nature and variety of innovation. *International Journal of Innovation Studies*, *2*(2), 65-79.

Edwards-Schachter, M. E., Matti, C. E., & Alcántara, E. (2012). Fostering quality of life through social innovation: A living lab methodology study case. *Review of policy research*, *29*(6), 672-692.

Eitan, A., Fischhendler, I., Herman, L., & Rosen, G. (2023). The role of community–private sector partnerships in the diffusion of environmental innovation: renewable energy in Southern Israel. *Journal of Economic Geography*, *23*(3), 683-719.

Ellis, T. (2010). *The New Pioneers: Sustainable business success through social innovation and social entrepreneurship*. John Wiley & Sons.

Elsen, S. (2018). *Eco-social transformation and community-based economy*. Routledge.

Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business model innovation for sustainability: Towards a unified perspective for creation of sustainable business models. *Business strategy and the environment*, *26*(5), 597-608.

Fastenrath, S., & Braun, B. (2018). Lost in transition? Directions for an economic geography of urban sustainability transitions. *Sustainability*, *10*(7), 2434.

Ferguson, P. (2018). *Degrowth politics: a critical theoretical and policy framework for decarbonisation*. Springer.

Fischer, B., Guerrero, M., Guimón, J., & Schaeffer, P. R. (2021). Knowledge transfer for frugal innovation: where do entrepreneurial universities stand?. *Journal of Knowledge Management*, *25*(2), 360-379.

Fonte, M. (2013). Food consumption as social practice: Solidarity purchasing groups in Rome, Italy. *Journal of Rural Studies*, *32*, 230-239.

França, A. S. L., Neto, J. A., Gonçalves, R. F., & Almeida, C. M. V. B. (2020). Proposing the use of blockchain to improve the solid waste management in small municipalities. *Journal of Cleaner Production*, *244*, 118529.

Fressoli, M., Arond, E., Abrol, D., Smith, A., Ely, A., & Dias, R. (2014). When grassroots innovation movements encounter mainstream institutions: implications for models of inclusive innovation. *Innovation and Development*, *4*(2), 277-292.

Fukuda-Parr, S., Lopes, C., & Malik, K. (2013). Institutional innovations for capacity development 1. In *Capacity for development* (pp. 1-21). Routledge.

Fuster Morell, M., & Espelt, R. (2018). A framework for assessing democratic qualities in collaborative economy platforms: Analysis of 10 cases in Barcelona. *Urban science*, *2*(3), 61.

Geels, F. W. (2004). From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. *Research policy*, *33*(6-7), 897-920.

Geels, F. W. (2019). Socio-technical transitions to sustainability: A review of criticisms and elaborations of the Multi-Level Perspective. *Current opinion in environmental sustainability*, *39*, 187-201.

Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy–A new sustainability paradigm?. *Journal of cleaner production*, *143*, 757-768.

Genovese, A., & Pansera, M. (2020). The circular economy at a crossroads: technocratic eco-modernism or convivial technology for social revolution?. *Capitalism Nature Socialism*, 1-19.

Gernert, M., El Bilali, H., & Strassner, C. (2018). Grassroots initiatives as sustainability transition pioneers: implications and lessons for urban food systems. *Urban Science*, *2*(1), 23.

Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner production*, *114*, 11-32.

Giampietri, E., Verneau, F., Del Giudice, T., Carfora, V., & Finco, A. (2018). A Theory of Planned behaviour perspective for investigating the role of trust in consumer purchasing decision related to short food supply chains. *Food Quality and Preference*, *64*, 160-166.

Gifford, E., McKelvey, M., & Saemundsson, R. (2021). The evolution of knowledge-intensive innovation ecosystems: Co-evolving entrepreneurial activity and innovation policy in the West Swedish maritime system. *Industry and Innovation*, *28*(5), 651-676.

Gorz, A. (1994). *Capitalism, socialism, ecology*. Verso.

Grasseni, C. (2014). Seeds of trust. Italy's gruppi di acquisto solidale (solidarity purchase groups). *Journal of Political Ecology*, *21*(1), 178-192.

Graziano, P. R., & Forno, F. (2012). Political consumerism and new forms of political participation: The Gruppi di Acquisto Solidale in Italy. *The ANNALS of the American Academy of Political and Social Science*, *644*(1), 121-133.

Graziano, V., & Trogal, K. (2023). Labor Power in the Repair Shop: Circuits of Repair Between Solidarity and Poor Economy. *Capitalism Nature Socialism*, *34*(2), 69-87.

Grimm, R., Fox, C., Baines, S., & Albertson, K. (2013). Social innovation, an answer to contemporary societal challenges? Locating the concept in theory and practice. *Innovation: The European Journal of Social Science Research*, *26*(4), 436-455.

Grin, J., Rotmans, J., & Schot, J. (2010). *Transitions to sustainable development: new directions in the study of long term transformative change*. Routledge.

Groth, O. J., Esposito, M., & Tse, T. (2015). What Europe needs is an innovation-driven entrepreneurship ecosystem: Introducing EDIE. *Thunderbird International Business Review*, *57*(4), 263-269.

Gui, E. M., & MacGill, I. (2018). Typology of future clean energy communities: An exploratory structure, opportunities, and challenges. *Energy research & social science*, *35*, 94-107.

Gunderson, R., Stuart, D., Petersen, B., & Yun, S. J. (2018). Social conditions to better realize the environmental gains of alternative energy: Degrowth and collective ownership. *Futures*, *99*, 36-44.

Gunningham, N. (2017). Building norms from the grassroots up: divestment, expressive politics, and climate change. *Law & Policy*, *39*(4), 372-392.

Gupta, P., Chauhan, S., Paul, J., & Jaiswal, M. P. (2020). Social entrepreneurship research: A review and future research agenda. *Journal of Business Research*, *113*, 209-229.

Gutberlet, J. (2015). Cooperative urban mining in Brazil: Collective practices in selective household waste collection and recycling. *Waste Management*, *45*, 22-31.

Gutberlet, J. (2021). Grassroots waste picker organizations addressing the UN sustainable development goals. *World Development*, *138*, 105195.

Gutberlet, J., Besen, G. R., & Morais, L. P. (2020). Participatory solid waste governance and the role of social and solidarity economy: Experiences from São Paulo, Brazil. *Detritus*, *13*(13), 167-180.

Gutberlet, J., Carenzo, S., Kain, J. H., & Mantovani Martiniano de Azevedo, A. (2017). Waste picker organizations and their contribution to the circular economy: Two case studies from a global south perspective. *Resources*, *6*(4), 52.

Ha, T., Bosch, O., & Nguyen, N. (2015). Defining the real needs of women smallholder farmers in Vietnam: the importance of grassroots participation and multi-stakeholder collaboration.

Hansmeier, H. (2021). Geography of eco-innovations vis-à-vis geography of sustainability transitions: two sides of the same coin. *GEIST–Geography of Innovation and Sustainability Transitions*, (07).

Hargrave, T. J., & Van de Ven, A. H. (2006). A collective action model of institutional innovation. *Academy of management review*, *31*(4), 864-888.

Hartley, K., van Santen, R., & Kirchherr, J. (2020). Policies for transitioning towards a circular economy: Expectations from the European Union (EU). *Resources, Conservation and Recycling*, *155*, 104634.

Hazarika, N., & Zhang, X. (2019). Evolving theories of eco-innovation: A systematic review. *Sustainable Production and Consumption*, *19*, 64-78.

Hermann, R. R., Pansera, M., Nogueira, L. A., & Monteiro, M. (2022). Socio-technical imaginaries of a circular economy in governmental discourse and among science, technology, and innovation actors: A Norwegian case study. Technological Forecasting and Social Change, 183, 121903.

Hermans, F., Roep, D., & Klerkx, L. (2016). Scale dynamics of grassroots innovations through parallel pathways of transformative change. *Ecological Economics*, *130*, 285-295.

Hobson, K., & Lynch, N. (2016). Diversifying and de-growing the circular economy: Radical social transformation in a resource-scarce world. *Futures*, *82*, 15-25

Hofmann, F. (2019). Circular business models: business approach as driver or obstructer of sustainability transitions?. *Journal of Cleaner Production*, *224*, 361-374.

Hoicka, C. E., Zhao, Y., McMaster, M. L., & Das, R. R. (2022). Diffusion of demand-side low-carbon innovations and socio-technical energy system change. *Renewable and Sustainable Energy Transition*, *2*, 100034.

Hoppe, T., & De Vries, G. (2018). Social innovation and the energy transition. *Sustainability*, *11*(1), 141.

Hoppe, T., Graf, A., Warbroek, B., Lammers, I., & Lepping, I. (2015). Local governments supporting local energy initiatives: Lessons from the best practices of Saerbeck (Germany) and Lochem (The Netherlands). *Sustainability*, *7*(2), 1900-1931.

Horbach, J., Rammer, C., & Rennings, K. (2012). Determinants of eco-innovations by type of environmental impact—The role of regulatory push/pull, technology push and market pull. *Ecological economics*, *78*, 112-122.

Horstink, L., Wittmayer, J. M., & Ng, K. (2021). Pluralising the European energy landscape: Collective renewable energy prosumers and the EU's clean energy vision. *Energy Policy*, *153*, 112262.

Hossain, M. (2016). Grassroots innovation: A systematic review of two decades of research. *Journal of Cleaner Production*, *137*, 973-981.

Hossain, M. (2018). Grassroots innovation: The state of the art and future perspectives. *Technology in Society*, *55*, 63-69.

Howson, P. (2021). Distributed degrowth technology: Challenges for blockchain beyond the green economy. *Ecological Economics*, *184*, 107020.

Hussain, S., Xuetong, W., Maqbool, R., Hussain, M., & Shahnawaz, M. (2022). The influence of government support, organizational innovativeness and community participation in renewable energy project success: A case of Pakistan. *Energy*, *239*, 122172.

Iaione, C. (2016). The CO-City: Sharing, collaborating, cooperating, and commoning in the city. *American Journal of Economics and Sociology*, *75*(2), 415-455.

Inês, C., Guilherme, P. L., Esther, M. G., Swantje, G., Stephen, H., & Lars, H. (2020). Regulatory challenges and opportunities for collective renewable energy prosumers in the EU. *Energy Policy*, *138*, 111212.

Ioannis, K., Raimondo, G., Dimitrios, G., Rosanna, D. G., Georgios, K., Gary, S., ... & Igor, N. F. (2017). Blockchain in energy communities. *Retrieved September*, *10*, 2019.

Irvin, R. A., & Stansbury, J. (2004). Citizen participation in decision making: is it worth the effort?. *Public administration review*, *64*(1), 55-65.

Jaeger-Erben, M., Hofmann, F., Marwede, M., Winzer, J., Hipp, T., Poppe, E., ... & Proske, M. (2020). From Take-Make-Dispose to a Circular Society: introduction of a new vision in six propositions.

Jaeger-Erben, M., Jensen, C., Hofmann, F., & Zwiers, J. (2021). There is no sustainable circular economy without a Circular Society. *Resources, Conservation and Recycling*, *168*(5), 105476.

Jensen, C. L., Oldin, F., & Andersen, G. (2022). Imagining and co-creating futures of sustainable consumption and society. Consumption and Society, 1(2), 336-357.

Joshi, G., & Yenneti, K. (2020). Community solar energy initiatives in India: A pathway for addressing energy poverty and sustainability?. *Energy and Buildings*, *210*, 109736.

Juma, N., Olabisi, J., & Griffin-EL, E. (2023). External enablers and entrepreneurial ecosystems: The brokering role of the anchor tenant in capacitating grassroots ecopreneurs. *Strategic Entrepreneurship Journal*.

Kallis, G. (2011). In defence of degrowth. *Ecological economics*, *70*(5), 873-880.

Kallis, G., Kostakis, V., Lange, S., Muraca, B., Paulson, S., & Schmelzer, M. (2018). Research on Degrowth. *Annual Review of Environment and Resources*, *43*, 291-316.

Kamler, B. (2008) 'Rethinking doctoral publication practices: Writing from and beyond the thesis', *Studies in Higher Education*, 33(3), 283-294.

Kar, A. K., Ilavarasan, V., Gupta, M. P., Janssen, M., & Kothari, R. (2019). Moving beyond smart cities: Digital nations for social innovation & sustainability. *Information Systems Frontiers*, *21*, 495-501.

Kesidou, E., & Demirel, P. (2012). On the drivers of eco-innovations: Empirical evidence from the UK. *Research policy*, *41*(5), 862-870.

Kezar, A. (2012). Bottom-up/top-down leadership: Contradiction or hidden phenomenon. *The Journal of Higher Education*, *83*(5), 725-760.

Khmara, Y., & Kronenberg, J. (2020). Degrowth in the context of sustainability transitions: In search of a common ground. *Journal of Cleaner Production*, *267*, 122072.

Kiparsky, M., Sedlak, D. L., Thompson Jr, B. H., & Truffer, B. (2013). The innovation deficit in urban water: the need for an integrated perspective on institutions, organizations, and technology. *Environmental engineering science*, *30*(8), 395-408.

Kirchherr, J., Urbinati, A., & Hartley, K. (2023). Circular economy: A new research field?. Journal of Industrial Ecology, 27(5), 1239-1251.

Kohtala, C. (2016). *Making sustainability: how Fab Labs address environmental issues*. Aalto University.

Kohtala, C. (2017). Making "Making" critical: How sustainability is constituted in fab lab ideology. *The Design Journal*, *20*(3), 375-394.

Koirala, B. P., Koliou, E., Friege, J., Hakvoort, R. A., & Herder, P. M. (2016). Energetic communities for community energy: A review of key issues and trends shaping integrated community energy systems. *Renewable and Sustainable Energy Reviews*, *56*, 722-744.

Konno, N., & Schillaci, C. E. (2021). Intellectual capital in Society 5.0 by the lens of the knowledge creation theory. Journal of Intellectual Capital, 22(3), 478-505.

Korhonen, J., Honkasalo, A., & Seppälä, J. (2018). Circular economy: the concept and its limitations. *Ecological economics*, *143*, 37-46.

Korhonen, J., Nuur, C., Feldmann, A., & Birkie, S. E. (2018). Circular economy as an essentially contested concept. *Journal of cleaner production*, *175*, 544-552.

Kraus, S., Burtscher, J., Niemand, T., Roig-Tierno, N., & Syrjä, P. (2017). Configurational paths to social performance in SMEs: The interplay of innovation, sustainability, resources, and achievement motivation. *Sustainability*, *9*(10), 1828.

Krueger, R., Schulz, C., & Gibbs, D. C. (2018). Institutionalizing alternative economic spaces? An interpretivist perspective on diverse economies. *Progress in Human Geography*, *42*(4), 569-589.

Kumar, A., & Agrawal, A. (2020). Recent trends in solid waste management status, challenges, and potential for the future Indian cities–A review. *Current Research in Environmental Sustainability*, *2*, 100011.

Kump, B., & Fikar, C. (2021). Challenges of maintaining and diffusing grassroots innovations in alternative food networks: A systems thinking approach. *Journal of cleaner production*, *317*, 128407.

Kunze, C., & Becker, S. (2015). Collective ownership in renewable energy and opportunities for sustainable degrowth. *Sustainability Science*, *10*, 425-437.

Kurniawan, T. A., Othman, M. H. D., Liang, X., Goh, H. H., Gikas, P., Kusworo, T. D., ... & Chew, K. W. (2023). Decarbonization in waste recycling industry using digitalization to promote net-zero emissions and its implications on sustainability. *Journal of environmental management*, *338*, 117765.

Lee, J. Y. (2019). A decentralized token economy: How blockchain and cryptocurrency can revolutionize business. *Business Horizons*, *62*(6), 773-784.

Leeuwis, C., Boogaard, B. K., & Atta-Krah, K. (2021). How food systems change (or not): Governance implications for system transformation processes. *Food security*, *13*(4), 761-780.

Leipold, S., Weldner, K., & Hohl, M. (2021). Do we need a 'Circular Society'? Competing narratives of the circular economy in the French food sector. *Ecological Economics*, *187*, 107086.

Levänen, J., Hossain, M., & Wierenga, M. (2022). Frugal innovation in the midst of societal and operational pressures. *Journal of Cleaner Production*, *347*, 131308.

Li, N., Zhao, X., Shi, X., Pei, Z., Mu, H., & Taghizadeh-Hesary, F. (2021). Integrated energy systems with CCHP and hydrogen supply: A new outlet for curtailed wind power. *Applied Energy*, *303*, 117619.

Loh, P., & Shear, B. (2019). Solidarity economy and community development: Emerging cases in three Massachusetts cities. In *Community Development and Democratic Practice* (pp. 55-71). Routledge.

Longhurst, N., & Chilvers, J. (2019). Mapping diverse visions of energy transitions: co-producing sociotechnical imaginaries. *Sustainability Science*, *14*(4), 973-990.

Lorek, S., & Spangenberg, J. H. (2014). Sustainable consumption within a sustainable economy–beyond green growth and green economies. *Journal of cleaner production*, *63*, 33-44.

Lüdeke-Freund, F., Gold, S., & Bocken, N. M. (2019). A review and typology of circular economy business model patterns. *Journal of Industrial Ecology*, *23*(1), 36-61.

Magnani, N., & Osti, G. (2016). Does civil society matter? Challenges and strategies of grassroots initiatives in Italy's energy transition. *Energy Research & Social Science*, *13*, 148-157.

Maksimovic, M. (2018). Greening the future: Green Internet of Things (G-IoT) as a key technological enabler of sustainable development. *Internet of things and big data analytics toward next-generation intelligence*, 283-313.

Malak-Rawlikowska, A., Majewski, E., Wąs, A., Borgen, S. O., Csillag, P., Donati, M., ... & Wavresky, P. (2019). Measuring the economic, environmental, and social sustainability of short food supply chains. *Sustainability*, *11*(15), 4004.

Manzini, E. (2015). *Design, when everybody designs: An introduction to design for social innovation*. MIT press.

Manzo, C., & Ramella, F. (2015). Fab labs in Italy: collective goods in the sharing economy. *Stato e mercato*, *35*(3), 379-418.

Maravilhas, S., & Martins, J. (2019). Strategic knowledge management in a digital environment: Tacit and explicit knowledge in Fab Labs. *Journal of business research*, *94*, 353-359.

Mariani, L., Trivellato, B., Martini, M., & Marafioti, E. (2022). Achieving sustainable development goals through collaborative innovation: Evidence from four European initiatives. *Journal of Business Ethics*, *180*(4), 1075-1095.

Martin, A., Armijos, M. T., Coolsaet, B., Dawson, N., AS Edwards, G., Few, R., ... & White, C. S. (2020). Environmental justice and transformations to sustainability. *Environment: Science and Policy for Sustainable Development*, *62*(6), 19-30.

Martin, C. J. (2016). The sharing economy: A pathway to sustainability or a nightmarish form of neoliberal capitalism?. *Ecological economics*, *121*, 149-159.

Martínez-Alier, J., Pascual, U., Vivien, F. D., & Zaccai, E. (2010). Sustainable de-growth: Mapping the context, criticisms, and future prospects of an emergent paradigm. *Ecological economics*, *69*(9), 1741-1747.

Matthies, A. L., Stamm, I., Hirvilammi, T., & Närhi, K. (2019). Ecosocial innovations and their capacity to integrate ecological, economic, and social sustainability transition. *Sustainability*, *11*(7), 2107.

Mavi, N. K., & Mavi, R. K. (2019). Energy and environmental efficiency of OECD countries in the context of the circular economy: Common weight analysis for malmquist productivity index. *Journal of environmental management*, *247*, 651-661.

Medici, M., Canavari, M., & Castellini, A. (2021). Exploring the economic, social, and environmental dimensions of community-supported agriculture in Italy. *Journal of Cleaner Production*, *316*, 128233.

Medina-García, C., de la Fuente, R., & Van den Broeck, P. (2021). Exploring the emergence of innovative multi-actor collaborations toward a progressive urban regime in Madrid (2015–2019). *Sustainability*, *13*(1), 415.

Mehmood, A., & Imran, M. (2021). Digital social innovation and civic participation: Toward responsible and inclusive transport planning. *European Planning Studies*, *29*(10), 1870-1885.

Mehr, H., Ash, H., & Fellow, D. (2017). Artificial intelligence for citizen services and government. *Ash Cent. Democr. Gov. Innov. Harvard Kennedy Sch., no. August*, 1-12.

Melles, G. (2021). Figuring the transition from circular economy to Circular Society in Australia. *Sustainability*, *13*(19), 10601.

Milios, L. (2022). Engaging the citizen in the circular economy: Transcending the passive consumer role. Frontiers in Sustainability, 1-7.

Moallemi, E. A., Malekpour, S., Hadjikakou, M., Raven, R., Szetey, K., Ningrum, D., ... & Bryan, B. A. (2020). Achieving the sustainable development goals requires transdisciplinary innovation at the local scale. *One Earth*, *3*(3), 300-313.

Morawska-Jancelewicz, J. (2022). The role of universities in social innovation within quadruple/quintuple helix model: Practical implications from polish experience. *Journal of the Knowledge Economy*, *13*(3), 2230-2271.

Moreau, V., Sahakian, M., Van Griethuysen, P., & Vuille, F. (2017). Coming full circle: why social and institutional dimensions matter for the circular economy. *Journal of Industrial Ecology*, *21*(3), 497-506.

Mouzakitis, Y., & Adamides, E. D. (2019, June). The bottom-up side of eco-innovation: mapping the dynamics of sustainable grassroots innovations. In *International Conference on Sustainable Design and Manufacturing* (pp. 61-71). Singapore: Springer Singapore.

Mulgan, G. (2006). The process of social innovation. *innovations*, *1*(2), 145-162.

Murray, A., Skene, K., & Haynes, K. (2017). The circular economy: an interdisciplinary exploration of the concept and application in a global context. *Journal of business ethics*, *140*, 369-380.

Muscat, A., de Olde, E. M., Ripoll-Bosch, R., Van Zanten, H. H., Metze, T. A., Termeer, C. J., ... & de Boer, I. J. (2021). Principles, drivers, and opportunities of a circular bioeconomy. *Nature Food*, *2*(8), 561-566.

Neska, E., & Kowalska-Pyzalska, A. (2022). Conceptual design of energy market topologies for communities and their practical applications in EU: A comparison of three case studies. *Renewable and Sustainable Energy Reviews*, *169*, 112921.

Nogueira, A., & Wallig, J. F. (2022). The post-industrial legacy in Brazil: where circular economy principles meet collective urban practices by design. Local Environment, 27(10-11), 1372-1393.

Norgaard, R. B., Kallis, G., & Kiparsky, M. (2009). Collectively engaging complex socio-ecological systems: re-envisioning science, governance, and the California Delta. *Environmental Science & Policy*, *12*(6), 644-652.

Ortiz, R., & Peris, J. (2022). The Role of Farmers' Umbrella Organizations in Building Transformative Capacity around Grassroots Innovations in Rural Agri-Food Systems in Guatemala. *Sustainability*, *14*(5), 2695.

Padilla-Rivera, A., Russo-Garrido, S., & Merveille, N. (2020). Addressing the social aspects of a circular economy: A systematic literature review. *Sustainability*, *12*(19), 7912.

Pansera, M., & Fressoli, M. (2021). Innovation without growth: Frameworks for understanding technological change in a Degrowth era. *Organization*, *28*(3), 380-404.

Pansera, M., & Owen, R. (2014). Eco-innovation at the "bottom of the pyramid." *Collaboration for Sustainability and Innovation: A Role For Sustainability Driven by the Global South? A Cross-Border, Multi-Stakeholder Perspective*, 293-313.

Pansera, M., & Sarkar, S. (2016). Crafting sustainable development solutions: Frugal innovations of grassroots entrepreneurs. *Sustainability*, *8*(1), 51.

Papaoikonomou, E., & Ginieis, M. (2017). Putting the farmer's face on food: governance and the producer–consumer relationship in local food systems. *Agriculture and Human Values*, *34*, 53-67.

Parker, M., Cheney, G., Fournier, V., & Land, C. (Eds.). (2014). *The Routledge companion to alternative organization*. Routledge.

Pastakia, A. (1998). Grassroots ecopreneurs: change agents for a sustainable society. *Journal of Organizational Change Management*, *11*(2), 157-173.

Patnaik, J., & Bhowmick, B. (2020). Promise of inclusive innovation: A Re-look into the opportunities at the grassroots. *Journal of Cleaner Production*, *259*, 121124.

Paulson, S. (2017). Degrowth: culture, power, and change. *Journal of political ecology*, *24*(1), 425-448.

Pellicer-Sifres, V., Belda-Miquel, S., Cuesta-Fernández, I., & Boni, A. (2018). Learning, transformative action, and grassroots innovation: Insights from the Spanish energy cooperative Som Energia. *Energy Research & Social Science*, *42*, 100-111.

Pereno, A., & Eriksson, D. (2020). A multi-stakeholder perspective on sustainable healthcare: From 2030 onwards. *Futures*, *122*, 102605.

Pesce, M., Tamai, I., Guo, D., Critto, A., Brombal, D., Wang, X., ... & Marcomini, A. (2020). Circular economy in China: Translating principles into practice. *Sustainability*, *12*(3), 832.

Phillips, W., Lee, H., Ghobadian, A., O'regan, N., & James, P. (2015). Social innovation and social entrepreneurship: A systematic review. *Group & Organization Management*, *40*(3), 428-461.

Pieroni, M. P., McAloone, T. C., & Pigosso, D. C. (2019). Business model innovation for circular economy and sustainability: A review of approaches. *Journal of cleaner production*, *215*, 198-216.

Prieto-Sandoval, V., Jaca García, C., & Ormazabal Goenaga, M. (2016). Circular Economy: An economic and industrial model to achieve the sustainability of society. In *Proceedings of the 22nd Annual International Sustainable Development Research Society Conference. Rethinking Sustainability Models and Practices: Challenges for the New and Old World Contexts* (Vol. 2, pp. 504-520). Lisbon: ISDRS.

Randhawa, P., Marshall, F., Kushwaha, P. K., & Desai, P. (2020). Pathways for sustainable urban waste management and reduced environmental health risks in India: winners, losers, and alternatives to waste to energy in Delhi. *Frontiers in Sustainable Cities*, *2*, 14.

Raworth, K. (2017). *Doughnut economics: seven ways to think like a 21st-century economist*. Chelsea Green Publishing.

Rennings, K. (2000). Redefining innovation—eco-innovation research and the contribution from ecological economics. *Ecological economics*, *32*(2), 319-332.

Rizos, V., Behrens, A., Van der Gaast, W., Hofman, E., Ioannou, A., Kafyeke, T., ... & Topi, C. (2016). Implementation of circular economy business models by small and medium-sized enterprises (SMEs): Barriers and enablers. *Sustainability*, *8*(11), 1212.

Robins, L. and Kanowski, P. (2008) 'PhD by publication: A student's perspective', *Journal of Research Practice*, 4(2), Article M3.

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin III, F. S., Lambin, E., ... & Foley, J. (2009). Planetary boundaries: exploring the safe operating space for humanity. *Ecology and society*, *14*(2).

Rommel, J., Radtke, J., Von Jorck, G., Mey, F., & Yildiz, Ö. (2018). Community renewable energy at a crossroads: A think piece on degrowth, technology, and the democratization of the German energy system. *Journal of Cleaner Production*, *197*, 1746-1753.

Rossi, A., Coscarello, M., & Biolghini, D. (2021). (Re) commoning food and food systems. The contribution of social innovation from solidarity economy. *Agriculture*, *11*(6), 548.

Rowan, N. J., & Galanakis, C. M. (2020). Unlocking challenges and opportunities presented by COVID-19 pandemic for cross-cutting disruption in agri-food and green deal innovations: Quo Vadis?. *Science of the Total Environment*, *748*, 141362.

Sage, C., Kropp, C., & Antoni-Komar, I. (2021). Grassroots initiatives in food system transformation: The role of food movements in the second 'Great Transformation.' In *Food system transformations*. Taylor & Francis.

Šahović, N., & Da Silva, P. P. (2016). Community renewable energy-research perspectives. *Energy Procedia*, *106*, 46-58.

Santoro, G., Vrontis, D., Thrassou, A., & Dezi, L. (2018). The Internet of Things: Building a knowledge management system for open innovation and knowledge management capacity. *Technological forecasting and social change*, *136*, 347-354.

Santos, F. M. (2012). A positive theory of social entrepreneurship. *Journal of business ethics*, *111*(3), 335-351.

Sarkar, S., & Pansera, M. (2017). Sustainability-driven innovation at the bottom: Insights from grassroots ecopreneurs. *Technological Forecasting and Social Change*, *114*, 327-338.

Savelli, I., & Morstyn, T. (2021). Better together: Harnessing social relationships in smart energy communities. *Energy Research & Social Science*, *78*, 102125.

Savelyeva, T., & Park, J. (2022). Blockchain technology for sustainable education. *British Journal of Educational Technology*, *53*(6), 1591-1604.

Schaltegger, S., & Wagner, M. (2011). Sustainable entrepreneurship and sustainability innovation: categories and interactions. *Business strategy and the environment*, *20*(4), 222-237.

Schouten, G., Leroy, P., & Glasbergen, P. (2012). On the deliberative capacity of private multi-stakeholder governance: the roundtables on responsible soy and sustainable palm oil. *Ecological Economics*, *83*, 42-50.

Schreuder, W., & Horlings, L. G. (2022). Transforming places together: Transformative community strategies responding to climate change and sustainability challenges. *Climate Action*, *1*(1), 1-15.

Schröder, P., Bengtsson, M., Cohen, M., Dewick, P., Hofstetter, J., & Sarkis, J. (2019). Degrowth within–Aligning circular economy and strong sustainability narratives. *Resources, Conservation and Recycling*, *146*, 190-191.

Schroeder, P., Anggraeni, K., & Weber, U. (2019). The relevance of circular economy practices to the sustainable development goals. *Journal of Industrial Ecology*, *23*(1), 77-95.

Schulz, C., & Bailey, I. (2014). The green economy and post-growth regimes: opportunities and challenges for economic geography. *Geografiska Annaler: Series B, Human Geography*, *96*(3), 277-291.

Scoones, I., Stirling, A., Abrol, D., Atela, J., Charli-Joseph, L., Eakin, H., ... & Yang, L. (2020). Transformations to sustainability: combining structural, systemic, and enabling approaches. *Current Opinion in Environmental Sustainability*, *42*, 65-75.

Scuotto, V., Tzanidis, T., Usai, A., & Quaglia, R. (2023). The digital humanism era triggered by individual creativity. Journal of Business Research, 158, 113709.

Secundo, G., Ndou, V., Del Vecchio, P., & De Pascale, G. (2020). Sustainable development, intellectual capital and technology policies: A structured literature review and future research agenda. *Technological Forecasting and Social Change*, *153*, 119917.

Sengers, F., Wieczorek, A. J., & Raven, R. (2019). Experimenting for sustainability transitions: A systematic literature review. *Technological Forecasting and Social Change, 145*, 153-164.

Seyfang, G. (2010). Community action for sustainable housing: Building a low-carbon future. *Energy Policy, 38*(12), 7624-7633.

Seyfang, G., & Haxeltine, A. (2012). Growing grassroots innovations: exploring the role of community-based initiatives in governing sustainable energy transitions. *Environment and Planning C: Government and Policy*, *30*(3), 381-400.

Seyfang, G., & Longhurst, N. (2013). Desperately seeking niches: Grassroots innovations and niche development in the community currency field. *Global Environmental Change*, *23*(5), 881-891.

Seyfang, G., & Smith, A. (2007). Grassroots innovations for sustainable development: Towards a new research and policy agenda. *Environmental politics*, *16*(4), 584-603.

Seyfang, G., Hielscher, S., Hargreaves, T., Martiskainen, M., & Smith, A. (2014). A grassroots sustainable energy niche? Reflections on community energy in the UK. *Environmental Innovation and Societal Transitions*, *13*, 21-44.

Sharma, H. B., Vanapalli, K. R., Samal, B., Cheela, V. S., Dubey, B. K., & Bhattacharya, J. (2021). Circular economy approach in solid waste management system to achieve UN-SDGs: Solutions for post-COVID recovery. *Science of The Total Environment*, *800*, 149605.

Singh, S. H., Bhowmick, B., Sindhav, B., & Eesley, D. (2020). Determinants of grassroots innovation: an empirical study in the Indian context. Innovation, 22(3), 270-289.

Singh, S., Sharma, P. K., Yoon, B., Shojafar, M., Cho, G. H., & Ra, I. H. (2020). Convergence of blockchain and artificial intelligence in IoT network for the sustainable smart city. *Sustainable cities and society*, *63*, 102364.

Smith, A. (2011). The transition city network: a review of current evolutions and renaissance. *Social movement studies*, *10*(01), 99-105.

Smith, A. (2017). Social innovation, democracy and makerspaces.

Smith, A., & Raven, R. (2012). What is protective space? Reconsidering niches in transitions to sustainability. *Research policy*, *41*(6), 1025-1036.

Smith, A., & Stirling, A. (2018). Innovation, sustainability, and democracy: An analysis of grassroots contributions. *Journal of Self-Governance and Management Economics*, *6*(1), 64-97.

Smith, A., Fressoli, M., & Thomas, H. (2014). Grassroots innovation movements: challenges and contributions. *Journal of Cleaner Production*, *63*, 114-124.

Smith, A., Hargreaves, T., Hielscher, S., Martiskainen, M., & Seyfang, G. (2016). Making the most of community energies: Three perspectives on grassroots innovation. *Environment and Planning A*, *48*(2), 407-432.

Smith, A., Hielscher, S., Dickel, S., Soderberg, J., & van Oost, E. (2013). Grassroots digital fabrication and makerspaces: Reconfiguring, relocating and recalibrating innovation?. *University of Sussex, SPRU Working Paper SWPS*, *2*.

Smith, T. S. (2017). Of makerspaces and hacklabs: Emergence, experiment and ontological theatre at the Edinburgh Hacklab, Scotland. *Scottish Geographical Journal*, *133*(2), 130-154.

Solis-Navarrete, J. A., Bucio-Mendoza, S., & Paneque-Gálvez, J. (2021). What is not social innovation. *Technological Forecasting and Social Change*, *173*, 121190.

Sonnier, E., & Grit, A. (2022). A narrative for circular economy in Cities: Conditions for a Mission-Oriented innovative system. City and Environment Interactions, 16, 100084.

Sormunen, P., & Kärki, T. (2019). Recycled construction and demolition waste as a possible source of materials for composite manufacturing. *Journal of building engineering*, *24*, 100742.

Sovacool, B. K., & Brisbois, M. C. (2019). Elite power in low-carbon transitions: A critical and interdisciplinary review. *Energy Research & Social Science*, *57*, 101242.

Sovacool, B. K., Griffiths, S., Kim, J., & Bazilian, M. (2021). Climate change and industrial F-gases: A critical and systematic review of developments, sociotechnical systems, and policy options for reducing synthetic greenhouse gas emissions. *Renewable and Sustainable Energy Reviews*, *141*, 110759.

Spekkink, W., Rödl, M., & Charter, M. (2022). Repair Cafés and Precious Plastic as translocal networks for the circular economy. Journal of Cleaner Production, 380, 135125.

Stamm, I. P., Hirvilammi, T., Matthies, A. L., & Närhi, K. (2017). Ecosocial innovations as part of social and solidarity economy: local models for a sustainable development. *RISUS-Revista de Inovação e Sustentabilidade*, *8*(4).

Staniškis, J. K., Staniškienė, E., Stankevičiūtė, Ž., Daunorienė, A., Ramanauskaitė, J., & Staniškis, J. K. (2022). Socio-Environmental-Economic Transformations Towards Sustainable Development. *Transformation of Business Organization Towards Sustainability: Systems Approach*, 81-165.

Stephens, J. C. (2020). *Diversifying power: why we need antiracist, feminist leadership on climate and energy*. Island Press.

Suchek, N., Fernandes, C. I., Kraus, S., Filser, M., & Sjögrén, H. (2021). Innovation and the circular economy: A systematic literature review. *Business Strategy and the Environment*, *30*(8), 3686-3702.

Sultana, S., Islam, M. S., Jahan, F., & Khatun, F. (2021). Awareness and practice on household solid waste management among the community people. *Open Journal of Nursing*, *11*(5), 349-366.

Sun, H., Edziah, B. K., Sun, C., & Kporsu, A. K. (2019). Institutional quality, green innovation, and energy efficiency. *Energy policy*, *135*, 111002.

Sun, Q. (2007). *Rebuilding Common Property Management: a Case Study of Community-Based Natural Resource Management in Rural Guizhou, China*. Wageningen University and Research.

Suriyankietkaew, S., Krittayaruangroj, K., & Iamsawan, N. (2022). Sustainable Leadership practices and competencies of SMEs for sustainability and resilience: A community-based social enterprise study. *Sustainability*, *14*(10), 5762.

Svenfelt, Å., Alfredsson, E. C., Bradley, K., Fauré, E., Finnveden, G., Fuehrer, P., ... & Öhlund, E. (2019). Scenarios for sustainable futures beyond GDP growth 2050. *Futures*, *111*, 1-14.

Svensson, G., Ferro, C., Høgevold, N., Padin, C., Varela, J. C. S., & Sarstedt, M. (2018). Framing the triple bottom line approach: Direct and mediation effects between economic, social and environmental elements. *Journal of cleaner production*, *197*, 972-991.

Swartz, L. (2017). Blockchain dreams: Imagining techno-economic alternatives after Bitcoin. *Another economy is possible: Culture and economy in a time of crisis*, *1*.

Tarde, G. (2010). *Gabriel Tarde on communication and social influence: Selected papers*. University of Chicago Press.

Taylor, C., Nanz, P., & Taylor, M. B. (2020). *Reconstructing Democracy: How citizens are building from the ground up*. Harvard University Press.

Temper, L., Walter, M., Rodriguez, I., Kothari, A., & Turhan, E. (2018). A perspective on radical transformations to sustainability: resistances, movements, and alternatives. *Sustainability Science*, *13*, 747-764.

Tesfaye, L. A., & Fougère, M. (2022). Frugal innovation hijacked: the co-optive power of co-creation. *Journal of Business Ethics*, 1-16.

Tidd, J., & Bessant, J. R. (2020). *Managing innovation: integrating technological, market and organizational change*. John Wiley & Sons.

Tonelli, M., & Cristoni, N. (2018). *Strategic management and the circular economy*. Routledge.

Troxler, P., & Wolf, P. (2010). Bending the rules: the fab lab innovation ecology.

Tsagkari, M., Roca, J., & Kallis, G. (2021). From local island energy to degrowth? Exploring democracy, self-sufficiency, and renewable energy production in Greece and Spain. *Energy Research & Social Science*, *81*, 102288.

Turnheim, B., Berkhout, F., Geels, F., Hof, A., McMeekin, A., Nykvist, B., & van Vuuren, D. (2015). Evaluating sustainability transitions pathways: Bridging analytical approaches to address governance challenges. *Global environmental change*, *35*, 239-253.

van Bueren, B. J., Argus, K., Iyer-Raniga, U., & Leenders, M. A. (2023). The circular economy operating and stakeholder model “eco-5HM” to avoid circular fallacies that prevent sustainability. Journal of Cleaner Production, 391, 136096.

Van Holm, E. J. (2015). Makerspaces and contributions to entrepreneurship. *Procedia-Social and Behavioral Sciences*, *195*, 24-31.

Varadarajan, R., & Kaul, R. (2018). Doing well by doing good innovations: alleviation of social problems in emerging markets through corporate social innovations. *Journal of Business Research*, *86*, 225-233.

Velenturf, A. P., & Purnell, P. (2021). Principles for a sustainable circular economy. *Sustainable Production and Consumption*, *27*, 1437-1457.

Vergragt, P. J., Dendler, L., De Jong, M., & Matus, K. (2016). Transitions to sustainable consumption and production in cities. *Journal of Cleaner Production*, *134*, 1-12.

Villalba-Eguiluz, U., Sahakian, M., González-Jamett, C., & Etxezarreta, E. (2023). Social and solidarity economy insights for the circular economy: Limited-profit and sufficiency. Journal of Cleaner Production, 418, 138050.

Volberda, H. W., Khanagha, S., Baden-Fuller, C., Mihalache, O. R., & Birkinshaw, J. (2021). Strategizing in a digital world: Overcoming cognitive barriers, reconfiguring routines, and introducing new organizational forms. *Long Range Planning*, *54*(5), 102110.

von Schönfeld, K. C., & Ferreira, A. (2021). Urban planning and european innovation policy: Achieving sustainability, social inclusion, and economic growth?. *Sustainability*, *13*(3), 1137.

Wahlund, M., & Hansen, T. (2022). Exploring alternative economic pathways: a comparison of foundational economy and Doughnut economics. *Sustainability: Science, Practice and Policy*, *18*(1), 171-186.

Ward, H. C., Lu, M. T. P., O'Connor, B. H., & Overton, T. (2015). Successful bottom-up faculty collaboration during institutional change. *Journal of Applied Research in Higher Education*, *7*(2), 308-330.

Washington, H., & Maloney, M. (2020). The need for ecological ethics in a new ecological economics. *Ecological Economics*, *169*, 106478.

Watkins, M., Casamayor, J. L., Ramirez, M., Moreno, M., Faludi, J., & Pigosso, D. C. (2021). Sustainable product design education: current practice. *She Ji: The Journal of Design, Economics, and Innovation*, *7*(4), 611-637.

Weber, K. M., & Rohracher, H. (2012). Legitimizing research, technology, and innovation policies for transformative change: Combining insights from innovation systems and multi-level perspective in a comprehensive ‘failures’ framework. *Research policy*, *41*(6), 1037-1047.

Westley, F., Antadze, N., Riddell, D. J., Robinson, K., & Geobey, S. (2014). Five configurations for scaling up social innovation: Case examples of nonprofit organizations from Canada. *The Journal of Applied Behavioral Science*, *50*(3), 234-260.

Widianingsih, L. P., Triyuwono, I., & Djamhuri, A. (2022). University Social Responsibility from the Transformative Ecofeminism Perspective. *Qualitative Report*, *27*(6).

Wilson, K. (2002) 'Quality assurance issues for a PhD by published work: A case study', *Quality Assurance in Education*, 10(2), 71-78.

Winans, K., Kendall, A., & Deng, H. (2017). The history and current applications of the circular economy concept. *Renewable and Sustainable Energy Reviews*, *68*, 825-833.

Wirtz, J., So, K. K. F., Mody, M. A., Liu, S. Q., & Chun, H. H. (2019). Platforms in the peer-to-peer sharing economy. *Journal of Service Management*, *30*(4), 452-483.

Wittmayer, J. M., Campos, I., Avelino, F., Brown, D., Doračić, B., Fraaije, M., ... & Pukšec, T. (2022). Thinking, doing, organising: Prefiguring just and sustainable energy systems via collective prosumer ecosystems in Europe. *Energy Research & Social Science*, *86*, 102425.

Wu, J., & Si, S. (2018). Poverty reduction through entrepreneurship: Incentives, social networks, and sustainability. *Asian Business & Management*, *17*, 243-259.

Zambon, S., & Monciardini, D. (2015). Intellectual capital and innovation. A guideline for future research. *Journal of Innovation Economics & Management*, (2), 13-26.

Zapata Campos, M. J., Carenzo, S., Charles, G., Gutberlet, J., Kain, J. H., Oloko, M. O., ... & Zapata, P. (2023). Grassroots innovations in 'extreme'urban environments. The inclusive recycling movement. *Environment and Planning C: Politics and Space*, *41*(2), 351-374.

Zhang, X., Bayulken, B., Skitmore, M., Lu, W., & Huisingh, D. (2018). Sustainable urban transformations towards smarter, healthier cities: Theories, agendas, and pathways. *Journal of Cleaner Production*, *173*, 1-10.

Żuk, P., & Żuk, P. (2022). Civic energy and the traditions of the idea of civil society: Dilemmas, frames, and discussions. *Energy Research & Social Science*, *92*, 102798.

Appendix

Figures

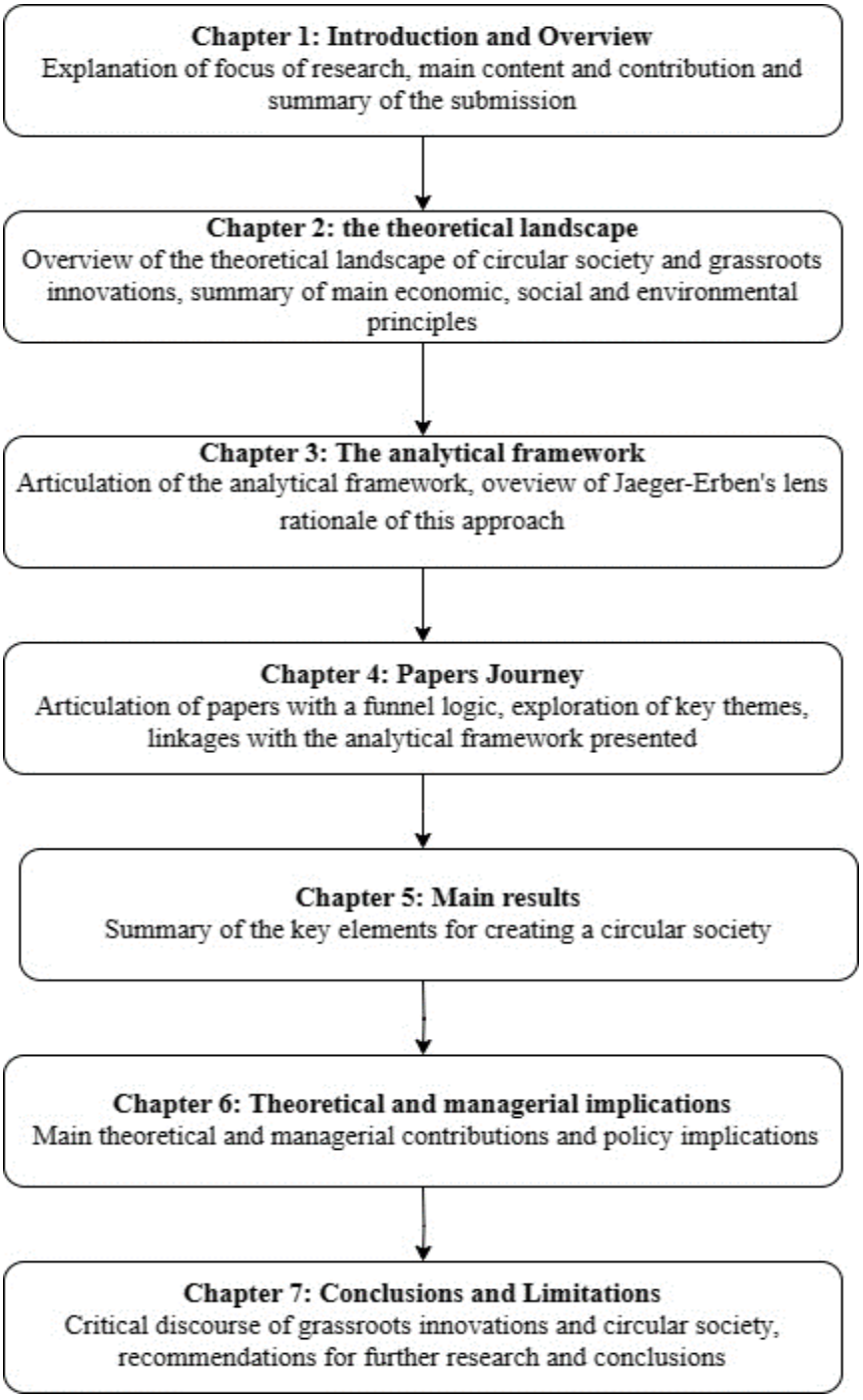

Figure 1: Thesis structure

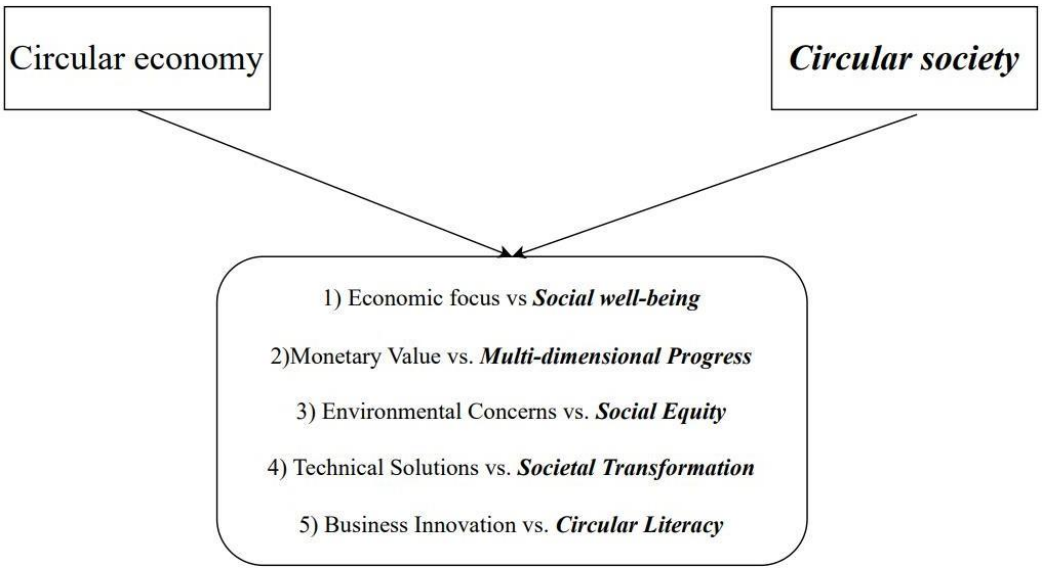

Figure 2: Circular economy vs Circular Society

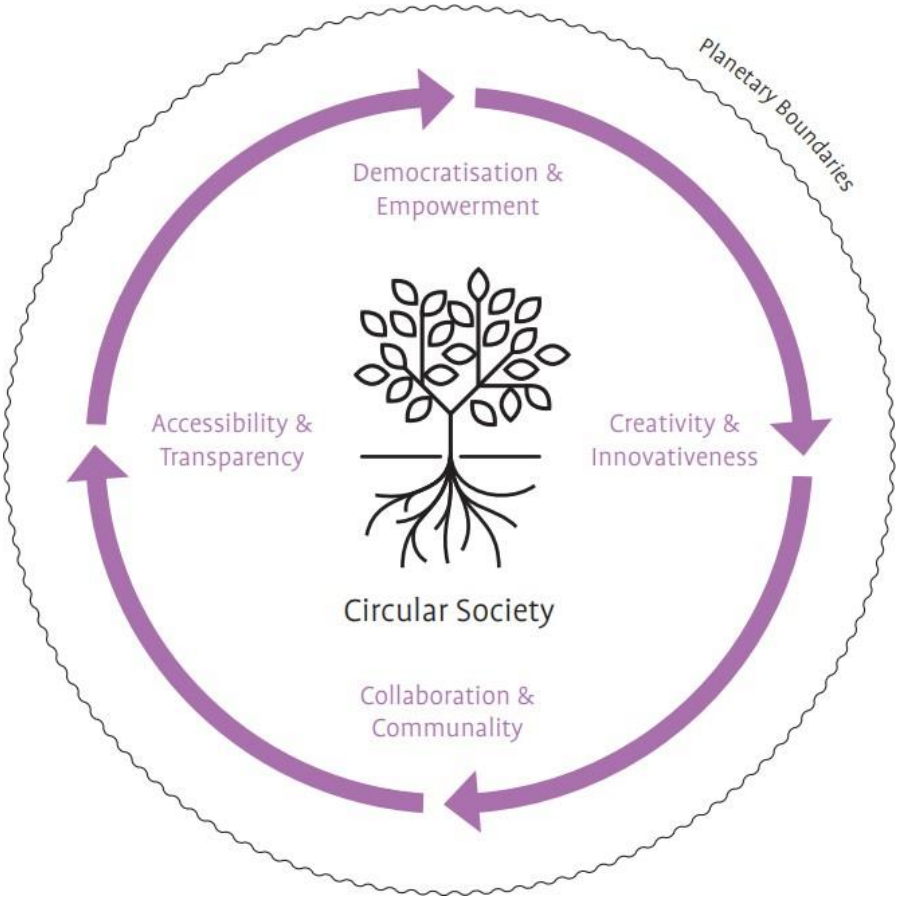

Figure 3: Jaeger-Erben Lens (2020)

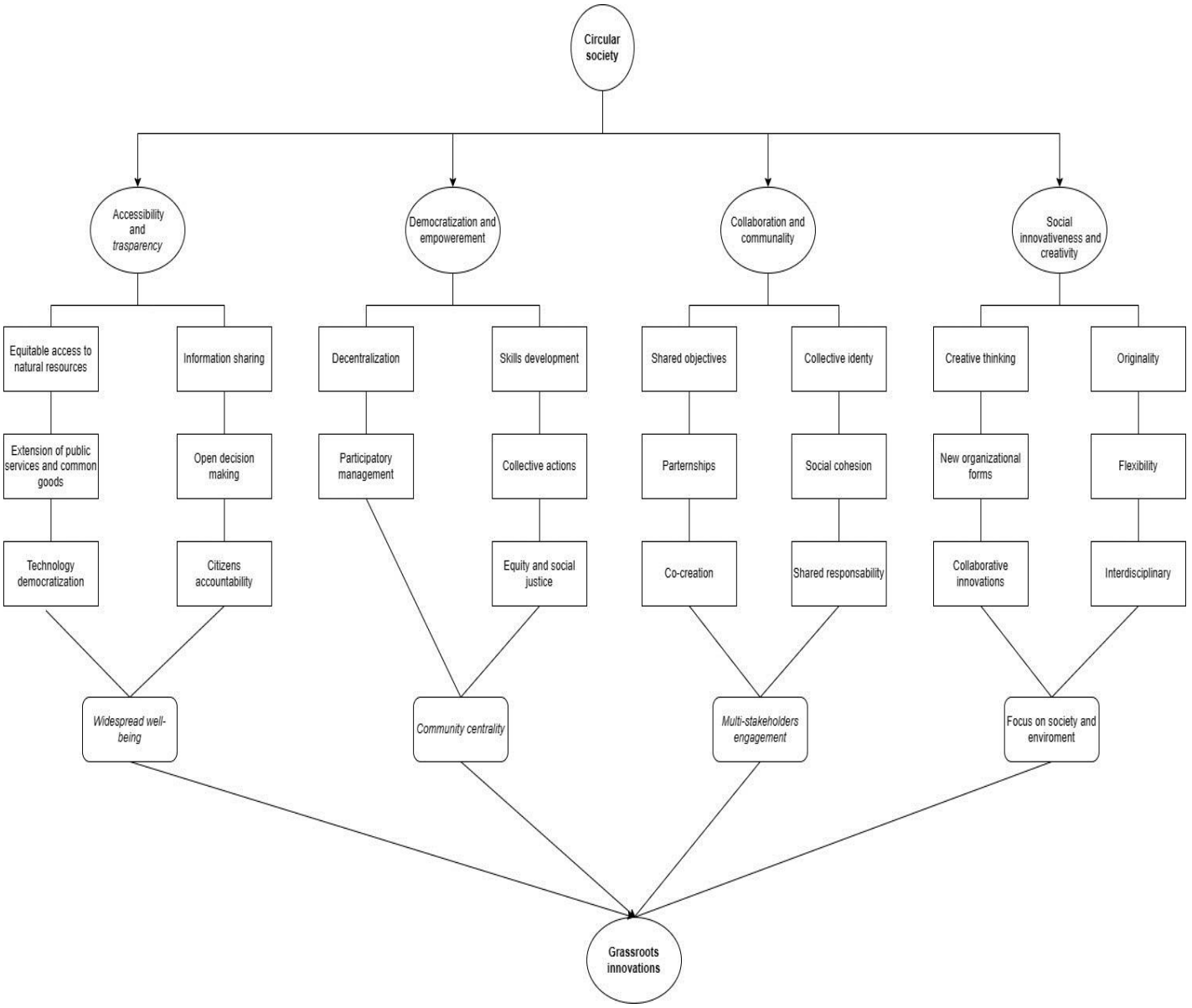

Figure 4: The Circular Society model

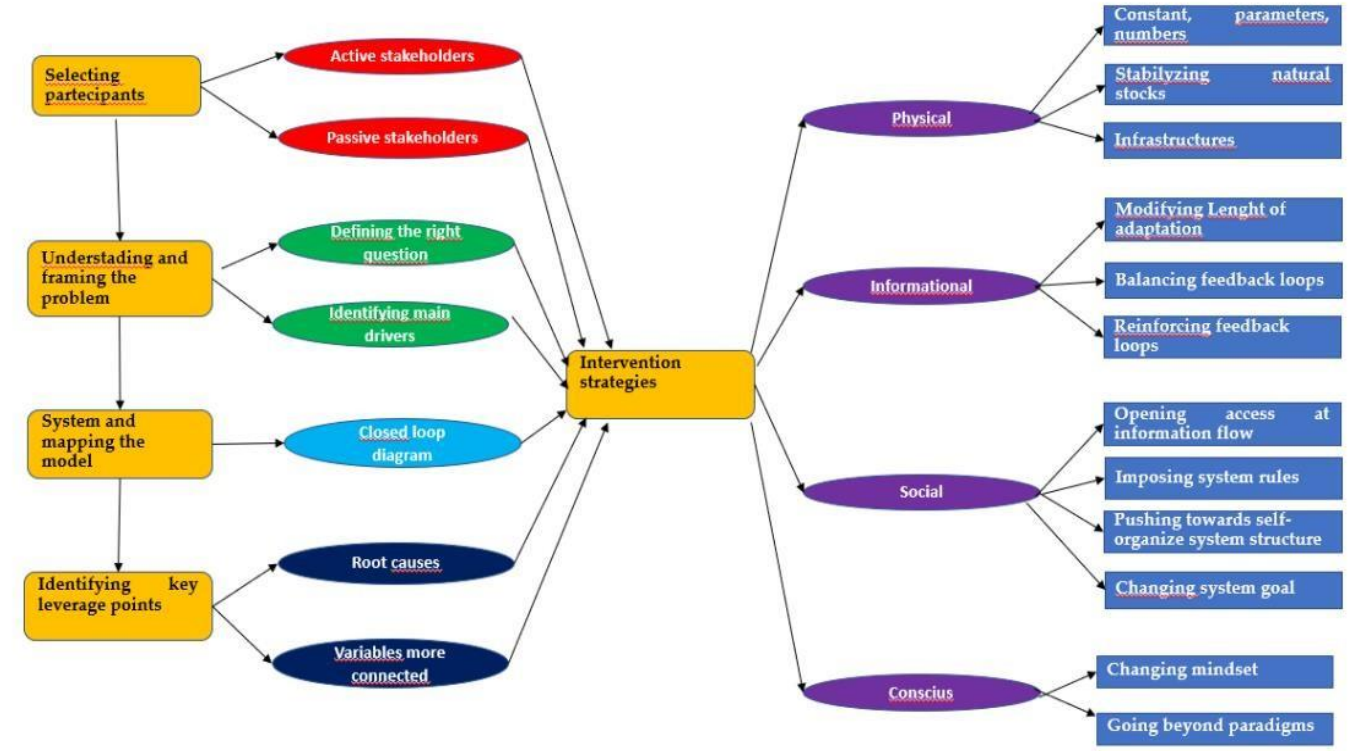

Figure 5: Overview of the Multi-stakeholder/ systems thinking analysis

(Own elaboration)

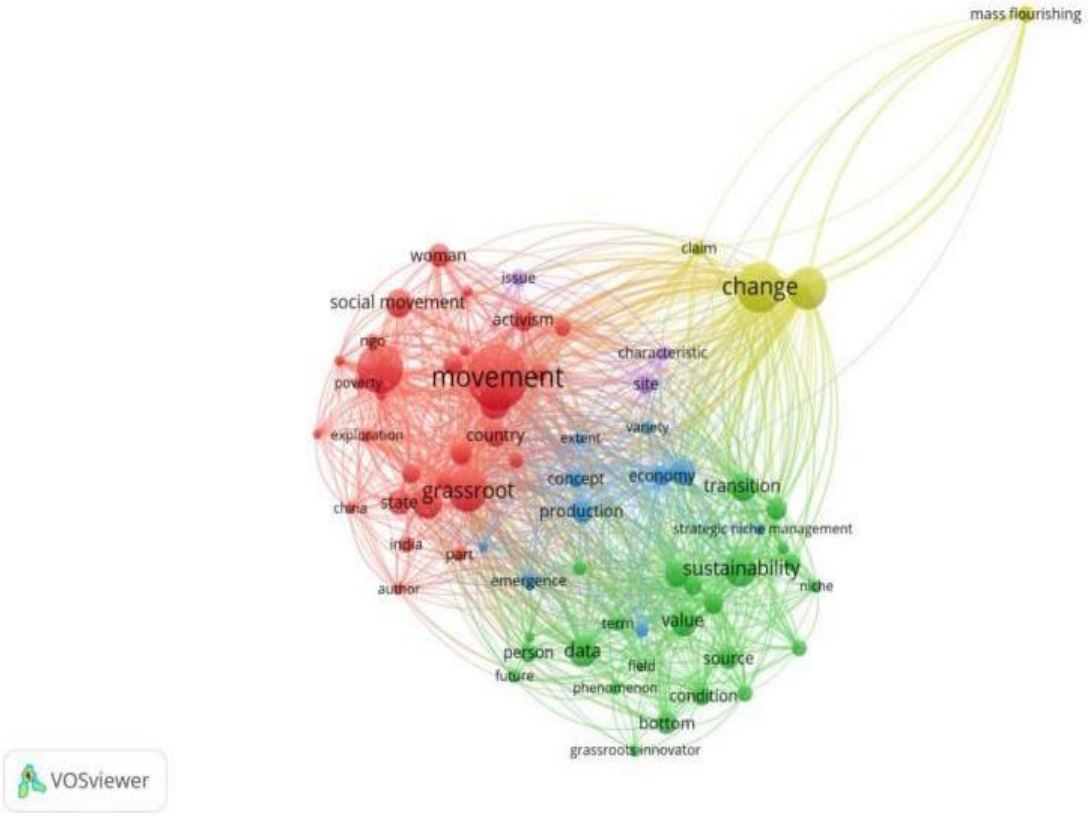

Figure 6: Clusters of keywords used by the reviewed literature on grassroots innovations (Authors elaboration)

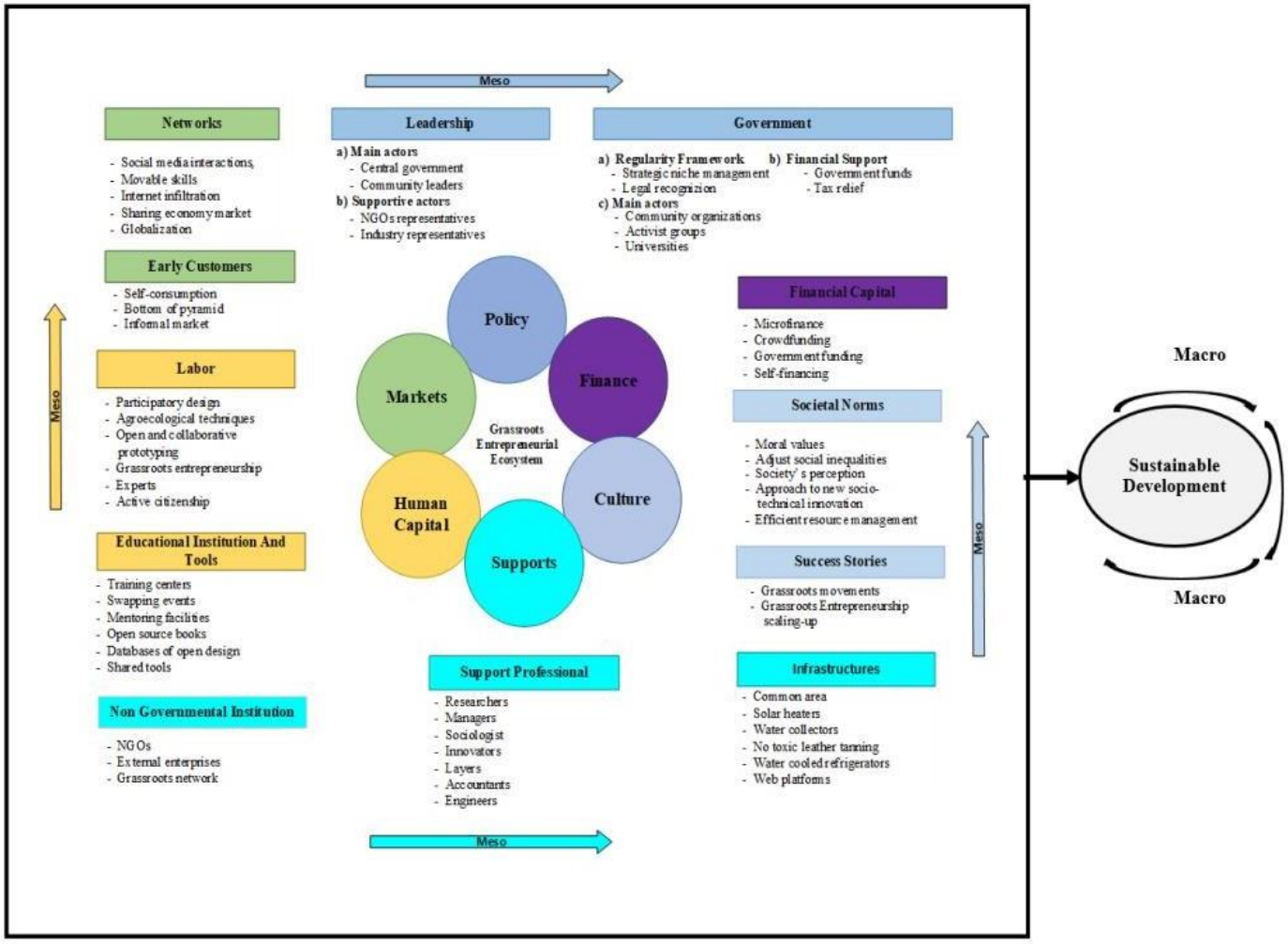

Figure 7: Grassroots entrepreneurial ecosystem

Adapted from (Iseberg 2011)

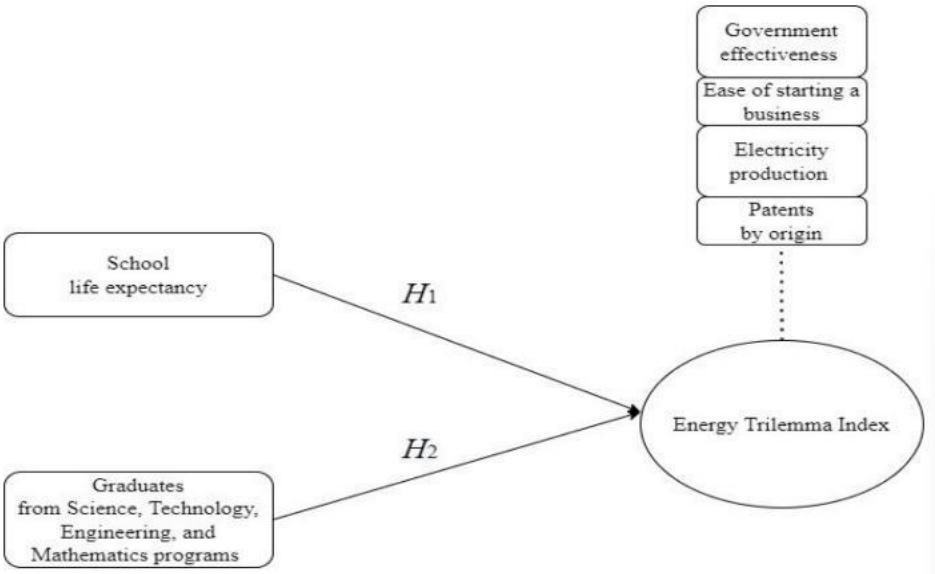

Figure 8: Research design authors' elaboration

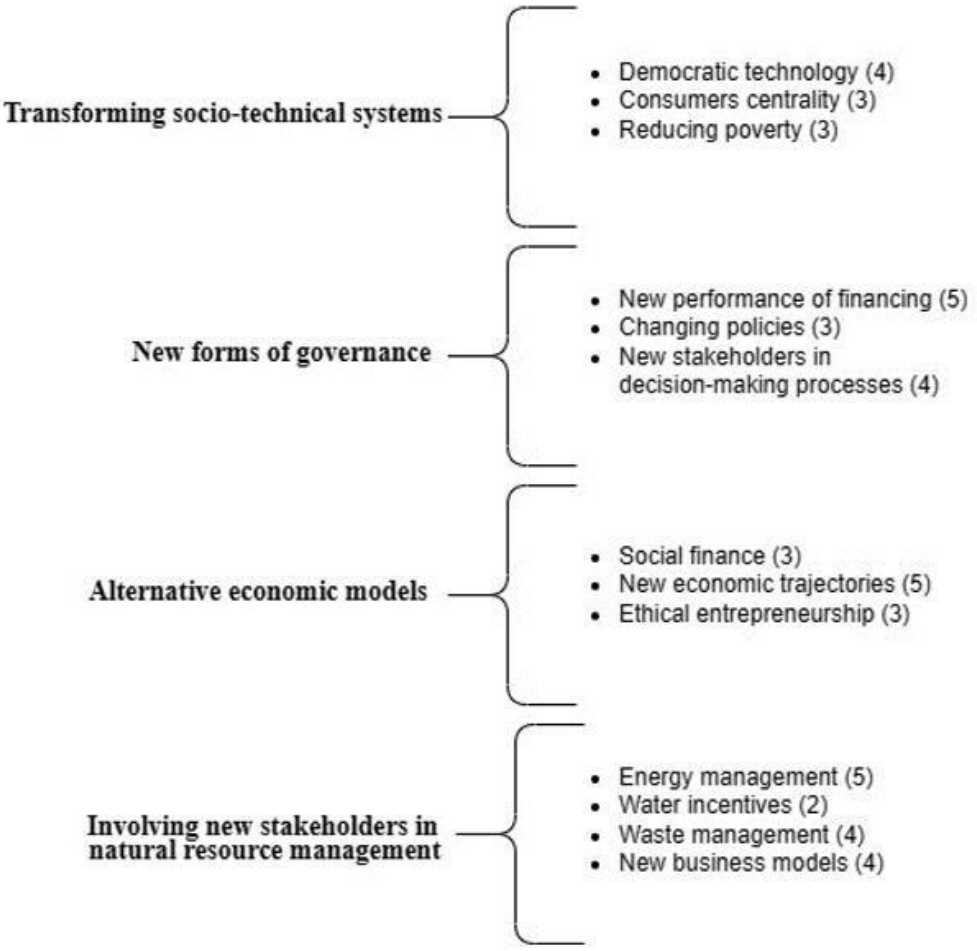

Figure 9: Blockchain and DSIs thematic analysis

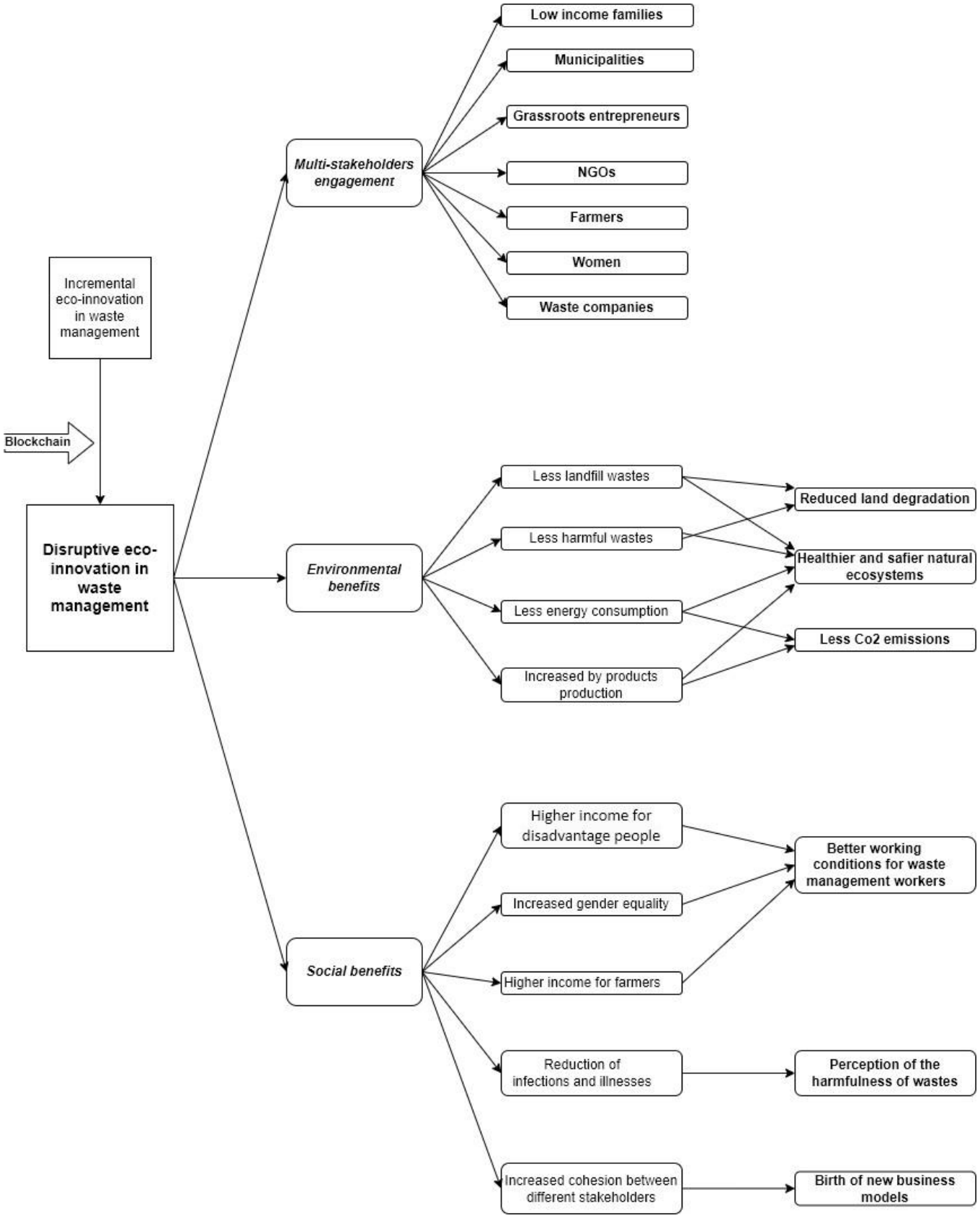

Figure 10: Conceptual framework: Disruptive eco-innovation in the waste management sector

(Own elaboration)

	Features of Innovation													
Type of Innovations	Community led initiatives	Interest driven	Network	Bottom-up	Value based	Affordable	Adaptable	local	Frugality	Indigenous	Learning	Intrinsic	User friendly	Sustainable
Catalytic innovation	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗	✗	✓
Disruptive innovation	✗	✗	✗	✗	✗	✓	✗	✗	✓	✗	✗	✗	✓	✗
Frugal Innovation	✗	✗	✗	✓	✗	✓	✓	✓	✓	✗	✗	✗	✓	✓
Gandhian innovation	✗	✗	✗	✗	✗	✓	✗	✓	✓	✗	✓	✗	✓	✓
Indigenous innovation	✗	✗	✗	✗	✗	✗	✓	✓	✗	✗	✓	✗	✗	✓
Jugaad	✗	✗	✗	✗	✗	✓	✓	✗	✓	✗	✗	✓	✗	✗
Reverse innovation	✗	✗	✗	✗	✗	✓	✓	✓	✓	✗	✗	✗	✓	✗
BOP innovation	✗	✗	✗	✗	✗	✓	✗	✓	✗	✗	✗	✗	✗	✗
Resource-constrained innovation	✗	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗
Grassroots innovation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Figure 11: Different social innovation forms

(Singh et al., 2020)

Tables

Paper	Key Themes
Work One	*systems thinking, grassroots movements, transition cities, sustainable cities, multi-stakeholder analysis*
Work Two	*grassroots innovations, sustainability, entrepreneurial ecosystems, social innovation, multi-stakeholders' engagement*
Work Three	*energy Trilemma Index, energy sustainability, education, sustainable innovativeness, energy management*
Work Four	*renewable RECs, Degrowth, responsible innovations, sustainability*
Work Five	*circular management, AI, circular business models, responsible innovations, ethic business model canvas*
Work Six	*sustainable innovations, disruptive innovations, blockchain, business ethics, new organizational forms*
Work Seven	*digital entrepreneur, SMEs, digitalization, digital orientation*
Work eight	*Disruptive innovations, Sustainable development, grassroots innovations, social innovations*
Work nine	*Ecofeminism; Sustainable innovations; Alternative organizations; Degrowth*
Work ten	*Grassroots innovations; makerspaces; democracy; makerspaces; digital fabrication; open-source technology*

Table 1. Key Themes Within the Discourse of this Thesis

Work	1	2	3	4	5	6	7	8	9	10
Typology	Proceeding	Book chapter	Peer-reviewed paper	Proceeding	Book chapter	Peer-reviewed paper	Proceeding	Proceeding	Proceeding	Peer-reviewed paper
Title	Systems thinking for Sustainable Cities: A conceptual model to analyze Transition Cities	Exploring Grassroots Innovation for Sustainable Development in Entrepreneurial Ecosystems	The impact of education on the Energy Trilemma Index: A sustainable innovativeness perspective for resilient energy systems	Renewable energy communities and Degrowth: participative governance for energy management	Dal Management Lineare al Management Circolare: l'Intelligenza Artificiale che Curva la Catena del Valore	A systematic literature review of Blockchain for disruptive sustainable innovations: A new Conceptual Framework	Blockchain for Disruptive eco-innovations: A multiple case study for alternative forms of waste management	Sustainable disruptive innovations: grassroots innovations for social and circular entrepreneurs	Ecofeminism and entrepreneurship: The case study of People's Bank of Govanhill	Fab Labs for Sustainable Cities of the Future: Re-evaluating the Smart City Concept
Publication	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
Methodology	Conceptual	Conceptual	Quantitative	Case study	Conceptual	Thematic analysis	Conceptual	Case study	Case study	Case study
Key themes	*Systems thinking, Grassroots movements, Transition cities, Sustainable cities, multi-stakeholder analysis*	*grassroots innovations, sustainability, entrepreneurial ecosystems, social innovation, multi-stakeholder engagement*	*Energy Trilemma Index, energy sustainability, education, sustainable innovativeness, energy management*	*Renewable energy community, post-growth, responsible innovations, sustainability*	*circular management, AI, circular business models, responsible innovations, ethical business model canvas*	*sustainable innovations, disruptive innovations, blockchain, business ethics, new organizational forms*	*digital entrepreneur, SMEs, digitalization, digital orientation*	*Disruptive innovations, Sustainable development, grassroots innovations, social innovations*	*Ecofeminism; Sustainable innovations; Alternative organizations; post-growth*	*Grassroots innovations; makerspaces; democracy; makerspaces; digital fabrication; open source technology*
Jaeger-Erben Theory	Accessibility, empowerment communality	Transparency. democratization collaboration	Accessibility empowerment social-innovativeness	Accessibility, empowerment creativity	Transparency, democratization creativity	Transparency democratization empowerment social-innovativeness creativity	Accessibility democratization empowerment creativity	Transparency, empowerment communality social-innovativeness	Accessibility democratization, communalty social-innovativeness creativity	Accessibility transparency democratization empowerment communality creativity

Table 2: Thesis thematic map

ECOLOGICAL ECONOMICS and DEGROWTH
(Altieri & Toledo, 2011); (Asara, et al., 2015); (Banerjee et al., 2021); (Bauhardt, 2014); (Brand-Correa et al., 2022); (Cockburn, et al., 2018); (Costanza et al., 1997); (Daly, 1991); (De Jesus & Mendonça, 2018); (Dodds, 1997); (Ferguson, 2018); (Gorz, 1994); (Grin et al., 2010); (Hermans et al., 2016); (Kallis, 2011); (Kallis, 2019); (Khmara & Kronenberg, 2020);(Krueger et al., 2018); (Martínez-Alier et al., 2010); (Nogueira & Wallig, 2022); (Pansera, & Fressoli, 2021); (Paulson, 2017); (Rockström, et al., 2009); (Rommel et al., 2018); (Schouten et al., 2012); (Schulz & Bailey, 2014); (Spekkink et al., 2022)
GRASSROOTS INNOVATIONS
(Akenji, 2014); (Bauwens et al., 2020); (Buechler et al., 2015); (Cohen & Muñoz, 2015); (Connors & McDonald, 2011); (Dyck & Silvestre, 2018).; (Fischer et al., 2021); (Fressoli et al., 2014); (Gernert, et al., 2018); (Gutberlet, 2018); (Hermans et al., 2016); (Hoicka et al., 2022); (Hossain, 2016); (Joshi & Yenneti, 2020); (Joshi & Yenneti, 2020); (Levänen, et al., 2022); (Martin, 2016); (Matthies, et al., 2019); (Pansera, M., & Sarkar, 2016); (Pastakia, 1998); (Sage et al., 2021); (Schouten et al., 2012); (Seyfang & Smith, 2007); (Seyfang & Haxeltine, 2012); (Seyfang et al., 2014; (Seyfang, 2010; (Seyfang, 2010); (Seyfang & Longhurst 2013; (Smith et al., 2016); (Smith, et al., 2014); (Suriyankietkaew, et al., 2020); (Taylor, et al., 2020).
CIRCULAR SOCIETY
(Jaeger-Erben et al., 2021); (Jaeger-Erben et al., 2018); (Melles, 2021); (Leipold, et al., 2021); (Svenfelt et al., 2019); (Wahlund & Hansen, 2022); (Raworth, 2017); (Rizos et al., 2016); (Medina-García et al., 2021); (Echefaj et al., 2023); (Bocken & Short, 2021); (Villalba-Eguiluz et al., 2023); (Clube & Tennant, 2023); (Kirchherr, et al., 2023); (Spekkink et al., 2022); (van Bueren et al., 2023); (Calisto Friant et al., 2023); (Nogueira & Wallig, 2022); Hermann et al., 2022); (Milios, 2022); (Jensen et al., 2022): (Sonnier & Grit, 2022); (Scuotto, et al., 2023); (Del Giudice et al., 2022); (Del Giudice et al., 2023); (Konno & Schillaci, 2021); (Chavez-Miguel et al., 2022).
CIRCULAR ECONOMY
(Ghisellini et al., 2016); (Korhonen et al. 2018); (Korhonen et al., 2018); (Lüdeke-Freund et al., 2019); (Mavi & Mavi, 2019); (Winans et al., 2017).
SUSTAINABLE INNOVATIONS
(Celata & Sanna, 2019); (Dias & Partidário, 2019); (Edwards-Schachter, 2018; (Evans et al., 2017); (Geels, 2019); (Hermans et al., 2016); (Mariani et al., 2022); (Martin, 2016); (Moallemi et al., 2020); (Rowan & Galanakis, 2020); (Schaltegger & Wagner, 2011); (von Schönfeld & Ferreira, 2021); (Wu & Si, 2018).
INSTITUTIONAL INNOVATIONS
(Ahlstrom et al., 2020); (Fukuda-Parr et al., 2013); (Geels, 2019); (Geels, 2004); (Gifford et al., 2021); (Gunningham, 2017); (Hargrave & Van de Ven, 2006); (Hoppe et al., 2015); (Irvin, & Stansbury, 2004); (Kezar, 2012); (Kiparsky et al., 2013); (Kiparsky et al., 2013); (Leeuwis et al., 2021); (Smith & Raven, 2012); (Smith, & Stirling, 2018); (Sun et al. 2019); (Tidd & Bessant 2020); (Ward et al., 2015).
ECO-INNOVATIONS
(Avelino et al., 2022); (Buhl et al., 2016); (Canwat, & Onakuse, 2022); (Carrillo-Hermosilla et al., 2010); (Chistov et al. 2023); (Dudek & Wrzaszcz, 2020); (Durán-Romero et al., 2020); (Eitan et al., 2023); (Eitan et al., 2023); (Fastenrath & Braun, 2018); (Fressoli et al., 2014); (Hansmeier, 2021); (Hazarika & Zhang, 2019); (Horbach et al., 2012); (Kraus et al., 2017); (Pansera & Owen, 2014); (Sarkar & Pansera, 2017); (Solis-Navarrete, 2015); (Sovacool, & Brisbois, 2019); (Stamm et al., 2017)
SOCIAL INNOVATIONS
(Angelidou & Psaltoglou, 2017); (Chen, & Qu, 2020); (Edwards-Schachter et al., 2012); (Ellis,2010). (Grimm et al., 2013); (Hoppe & De Vries, 2018); (Kar, et al., 2019); (Manzini, 2015). (Morawska-Jancelewicz, 2022); (Mulgan, 2006); (Santos, 2012); (Tarde, 2010); (Varadarajan & Kaul, 2018); (Westley, et al., 2014); (Wu & Si, 2018).

Table 3: Main authors and main papers

Area of application	Transition city Main Activities
Buildings and housing	Eco-construction Cohousing
Education	Transition local schools Workshops about future scenarios
Food	Shared garden Seeds and plant swaps Allotments association
Energy and Grid	Renewable energy supply companies Energy communities Microgrid systems
Water	Systems to collect rainwater
Waste	Food recycling Makerspaces Recycling workshops
Health and wellbeing	Complementary health practitioners Discussion groups on national health service
Economics and livelihoods	Sustainable business park Sharing economy markets
Local government	Decentralized control of the commons Multi-stakeholder management

Table 4: Main activities of transition cities

(Brunetta & Baglione 2013;Connors & McDonald, 2011)

Hypothesis	Evidence
H_1: The Energy Trilemma Index is positively associated with the school life expectancy	**Accepted**
H_2: The Energy Trilemma Index is positively associated with the fraction of persons with a STEM degree compared to the total number of graduates	**Rejected**

Table 5: Hypotesis tested.

Dimension	Growth-oriented organizations	Post-growth-oriented organizations
Underpinning Values	Profit Making Competition A-cultural Value-free	Social Justice & Equality Cooperation, Autonomy & Self-sufficiency Culturally Specific Overtly Normative
Underpinning Resources	Organizations that benefit from commodification of common resources pools (e.g. water, land, natural resources, public goods etc.) and labour.	Organizations that oppose commodification and appropriation of the commons. Valorise or reinforce community democratic control over technology.
Ownership & Governance	Privately owned, management led, controlled by private board. Increasingly characterised by trans-national forms of ownership.	Diverse forms of ownership for example, worker-owned coops, community ownerships, local ownership, family ownership, distributed ownership etc.
Production/ Consumption Patterns	Export-oriented, fragmented, geographical and social division of labour. Tendency to separate production/producers from consumption/consumers.	Oriented to local markets, tendency to involve consumers in the decision-making process of the producers.
Surplus	Surplus is usually re-invested to increase total factor productivity. In general, there is no democratic mechanism to decide how surplus is invested.	Surplus can be either re-invested to increase factor productivity or redistributed among the participants. In any case, the decision-making process tend to be democratic.
Intellectual Property	Organizations that usually (with few exceptions) favour strong intellectual property regimes.	Opensource, free-licences, distributed forms of knowledge production.
Technology Design	Expert design, highly reliant on science output, planned obsolesce, constant search for novelty.	Expert plus diffused participatory design. Tendency to produce *convivial forms of technology*.
Power Relationships	These organisations are usually embedded in socio-economic clusters that tend to escape democratic control. They enjoy the support of political elites and scientific institutions.	These organisations usually rely on local social network. Some explicitly challenge dominant power structure in search of social emancipation and autonomy.
Scale	Variable scale with a tendency to huge aggregations and oligopolies.	Reduced scale, tendency to reproduce the model instead of scaling up.

Table 6: Growth oriented vs Degrowth/Post-growth organizations (Pansera & Fressoli, 2021)

REC models	**Can be a Degrowth organization?**
Public lead	No
Pluralistic model	Yes
Community energy builder	Partially

Table 7: RECs and Degrowth (Own calculations)

Characteristics	Capitalistic Organization	Ecofeminist Organization
Values	-Maximization of profit -Reproducible -Deterritorialized -Bigger is better -Global	-Equity -Environmental justice -Territorialized -Reproduction -Local
Resources	-Money -Salaried labor -Commodification -Natural resources -Market	-Time banks -Gift economy -Swapping -Wastes -Informal market
Main Stakeholders	-Customers -Employees, -Shareholders -Suppliers	-Volunteers -Local communities -Ethics and gender minorities -Women
Organizational structure	-Pyramidal -Companies -Patriarchal	-Horizontal -Cooperatives -Matriarchal

Table 8: Characteristics of capitalistic and ecofeminist organizations

Source: our elaboration

Organizational models	**Literature**	**Main Characteristics**
Renewable energy communities	(Ambole et al., 2021); (Berthod et al., 2023); (Chantrel et al., 2021); (Gunderson et al., 2018); (Hussain et al., 2022); (Kunze & Becker, 2015); (Rommel, et al., 2018); (Šahović & Da Silva, 2016); (Savelli & Morstyn, 2021); (Wahlund & Palm, 2022)	11. Decentralized 12. Renewable 13. Community-driven 14. Localized 15. Sustainable 16. Empowering 17. Collaborative 18. Resilient 19. Inclusive 20. Self-sufficient
Fab Labs/makerspaces	(Kohtala, 2016); (Kohtala, 2017); (Manzo & Ramella,2015); (Maravilhas & Martins, 2019); (Smith, et al., 2013); (Smith, 2017); (Smith, 2017); (Troxler & Wolf, 2010); (Van Holm, 2015)	11. Digital fabrication 12. Open access 13. Innovation 14. Collaboration 15. Creativity 16. Community 17. Hands-on 18. Prototyping 19. DIY (Do It Yourself) 20. Maker culture
Solidarity Purchasing Groups	(Baldi et al., 2019); (Brunori et al., 2012); (Cattivelli & Rusciano, 2020); (Fonte et al., 2013); (Grasseni, et al., 2014); (Graziano & Forno, 2012); (Loh & Shear, 2019); (Medici, et al., 2012)	11. Local 12. Cooperative 13. Sustainable 14. Voluntary 15. Community-driven 16. Zero-kilometer 17. Collective 18. Ethical 19. Direct relationship 20. Affordable
Communitarian waste management	(França, et al., 2020); (Gutberlet et al., 2020); (Gutberlet, 2021); (Kumar & Agrawal, 2020); (Randhawa et al., 2020); (Sultana et al., 2021)	11. Collaborative 12. Local 13. Circular 14. Sustainable 15. Inclusive 16. Transparent 17. Resourceful 18. Community-driven 19. Responsible 20. Waste reduction

Table 9: Main organizational models for the Circular Society

Source: our elaboration

Formulas

$$ETI = \beta_0 + \beta_1 SLE + \beta_2 STEM\% + \beta_3 GEI + \beta_4 EOSAB + \beta_5 GEO + \beta_6 PPPGDP + \varepsilon$$

Formula 1: Energy trilemma index regression analysis