



LUND UNIVERSITY

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Start-ups as The Driver of Circular Economy: The Case of Indonesia

by

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Abstract:

This study illuminates the pivotal role of start-ups in driving circular economy (CE) implementation in Indonesia. Using the Multi-Level Perspective (MLP) framework, this research explores the dynamic contributions of start-ups in fostering sustainable transitions from a linear to a circular economy. The qualitative data collection involved document review and semi-structured interviews, revealing key enablers such as market forces, multi-stakeholder partnerships, social media utilization, continuous innovation, and technological advancement that have leveraged the development of CE start-ups. However, these niche innovators face regime-level challenges, including low awareness and limited knowledge, regulatory constraints, and financial hurdles. Despite these obstacles, start-ups significantly influence environmental, economic, and social dimensions, thus facilitating broader societal shifts. This research highlights the instrumental role of Indonesian start-ups in driving the transition to a more sustainable and circular economy.

Keywords: Start-ups, Circular Economy, Indonesia, MLP Framework, Sustainability Transition

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List of Abbreviations

B2B	Business-to-business
Bappenas	Indonesian Ministry of National Development Planning
BAU	Business as usual
CE	Circular economy
FMCG	Fast-Moving Consumer Goods
MLP	Multi-level perspective
NGO	Non-governmental organization
RPJMN	Indonesian Medium-Term Development Plan
R&D	Research and development
SDGs	Sustainable development goals

1. Introduction

In recent years, there has been a spike in interest in the circular economy (CE), reflected by the growing body of articles and papers published in 2016, reaching more than 100 in total (Kirchherr et al., 2017). According to Ellen Macarthur Foundation (2019), CE is a solution framework based on three principles; eliminate waste and pollution, circulate products and materials, and regenerate nature. CE is designed to reduce the use of resources and minimize waste by optimizing the flow of materials and energy. It aims to create a regenerative system that slows down, closes, and narrows material and energy loops (Geissdoerfer et al., 2017). Another definition of CE comes from Stahel (2016), which is to minimize waste and promote the closed-loop system in industrial systems. This can be achieved by utilizing waste from one process into resources for others.

CE is a critical strategy to mitigate climate change by reducing emissions associated with product production. By 2050, it is projected that the extraction and utilization of materials will increase twofold compared to 2015 levels, posing a significant threat to Earth's life support systems, which are already under tremendous strain and approaching a breaking point (UNEP, 2017). According to the Ellen Macarthur Foundation (2019), CE offers a cost-effective solution to tackle climate change, with potential emissions reductions of up to 40% in 2050 for four crucial industrial materials: cement, steel, plastic, and aluminum. Additionally, applying CE strategies to the food system could reduce emissions by up to 49% by 2050.

Currently, the global economy is concerning as it is only 7.2% circular, indicating the number of resources that are being effectively recycled and reintegrated into the economy. This figure has been consistently declining year on year (Circle Economy, 2023). The advancement of CE necessitates establishing a worldwide initiative involving major players such as the United Nations and G20 countries (Geng et al., 2019). The critical role of G20 governments in this paradigm shift is indicated by their combined accountability for approximately 75% of global material consumption and 80% of global greenhouse gas emissions, placing them at the forefront of efforts to enhance resource efficiency and promote material circularity (OECD, 2021).

Among the G20 nations, Indonesia stands out as an intriguing case study. Once severely impacted by the 1997 Asian Financial Crisis, Indonesia has since transformed itself into a key global player, exemplified by its recent G20 presidency in 2022 and its upcoming ASEAN Chairmanship in 2023 (PwC, 2021). Richly endowed with natural resources, including the world's third-largest tropical rainforest and the most extensive tropical peatlands, Indonesia shoulders considerable responsibility in mitigating the effects of climate change (World Bank, 2022). With a committed goal of achieving net-zero emissions by 2060, the country is strategically positioned to demonstrate its international leadership in its sustainability transition efforts.

In the past, Indonesia, like many nations, has grappled with substantial environmental and social issues arising from the traditional linear model of resource consumption, which is characterized by extraction, use, and disposal, leading to pollution, resource depletion, and waste accumulation (Fatimah et al., 2020). Recognizing this, the Indonesian Ministry of National Development Planning (Bappenas), the Embassy of Denmark, and UNDP Indonesia (2021) jointly reported that Indonesia is actively striving to transform its economic model. The country aims to fully embrace CE principles in support of its Sustainable Development Goals (SDGs), marking a crucial turning point in its socioeconomic trajectory.

In the pursuit of transitioning from a linear to a circular economy, Indonesia faces the challenge of implementing sustainability transitions. These transitions necessitate significant changes in various sectors of the economy and society. Innovative approaches and systems are crucial to make this shift toward more sustainable and circular practices. Start-ups, renowned for their agility and emphasis on innovation, assume a pivotal role in driving this transformative process (Schaltegger & Wagner, 2011; Lewandowski, 2016; Närvänen et al., 2020).

Start-ups possess distinctive characteristics that position them as influential catalysts for sustainability transitions. Their agility, adaptability, and dynamic capabilities enable them to introduce and scale novel ideas swiftly. Consequently, start-ups are adept at responding promptly to evolving market trends, societal demands, and regulatory frameworks, potentially making them more effective contributors to sustainability transitions when compared to established organizations (Bauwens et al., 2019; Bocken et al., 2016). By capitalizing on these unique qualities, start-ups can drive the necessary changes toward a circular economy in Indonesia.

Indonesian start-ups are at the forefront of finding innovative ways to close the resource loop and support the transitions from linear to CE. They are turning plastic waste into construction materials in Jakarta and rescuing overproduced food in several major cities, making start-ups important in CE development. In a country like Indonesia, with a growing economy and a population of over 270 million, the potential for start-ups to drive the circular economy is significant. According to Start-up Ranking (2022), Indonesia ranks sixth globally and second in Asia regarding the number of start-ups. While the exact proportion of start-ups focused on CE is still being determined, increasing circular start-ups have emerged, capturing public attention. For instance, in 2022, Octopus and Waste4Change, two waste management start-ups in Indonesia, secured \$5 million in funding (Pratama, 2022; Shu, 2022). Despite these promising developments, the evolution of CE in Indonesia is still in its early phases, and a comprehensive understanding of the role of start-ups in this transition awaits further exploration.

To unpack the dynamics of these sustainability transitions, notably the shift from a linear to a circular economy, and to identify the roles of various stakeholders, the Multi-Level Perspective (MLP) framework proves useful. This framework, widely employed in sustainability transition research, enables a more profound examination of start-ups' role in driving the CE in Indonesia by providing a three-tiered analysis incorporating governmental

and external forces (Geels, 2002; Geels, 2011). Additionally, the CE in Indonesia extends beyond the conventional 3R (reduce, reuse, recycle) framework and incorporates the more comprehensive 9R framework proposed by Potting et al. (2017). This model embraces a broader spectrum of sustainability actions, including refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, and recover, thus providing a more complex understanding of CE in the Indonesian context, as supported by recent reports from Bappenas (2022). This thesis, therefore, employs the MLP and 9R frameworks to explore how Indonesian start-ups contribute to the sustainable transition toward a circular economy.

1.1. Aim and Scope

This study aims to explore the role of start-ups in driving the implementation of the circular economy (CE) in Indonesia. Several research questions will be addressed to achieve the aim of the study. The first research question is: ***What are the key factors enabling start-ups to contribute to the development and implementation of circular economy practices, and what are the associated impacts of their involvement?***

Next, the study will pose a second research question: ***What are the challenges faced by start-ups in Indonesia in promoting and facilitating the adoption of circular economy practices?*** This question is important as it can provide useful information about the external and internal factors that may hinder or support the start-ups' efforts in promoting CE in Indonesia and potentially beyond.

The correlative nature of these research questions is evident in that the understanding of the challenges faced by start-ups offers insights into their methods of overcoming these hindrances, thereby contributing to the development and implementation of CE practices. Subsequently, the insights derived from the secondary research question will enrich the responses to the first research question, ensuring a comprehensive exploration of the topic. The study will examine the current state of the circular economy in Indonesia and take a closer look at the landscape of start-ups in Indonesia that are focused on promoting CE to answer these research questions. This includes identifying the challenges and opportunities these start-ups face when implementing CE practices.

The expected results of this research will not only provide a clearer understanding of the role of start-ups in driving CE in Indonesia. However, they will also reveal strategies to enhance their effectiveness and growth within the CE sector.

1.2. Outline of the Thesis

This thesis is structured into six distinct parts: introduction, literature review, theoretical approach, methodology, analysis and discussion, and conclusion. The introduction serves as the first chapter, providing a comprehensive understanding of the concept and significance of the CE while also explaining why Indonesia's case is a particularly interesting topic of discussion. Furthermore, this chapter offers a general overview of the emergence and growth of start-ups in Indonesia. The aim and scope of this study are also presented in the introduction.

Chapter two focuses on the literature review, which examines the CE within global, Asian, and Indonesian contexts and sustainability transitions. Additionally, this chapter delves into the existing literature regarding the role of start-ups as drivers of CE. Chapter three, the theoretical approach, presents the analytical framework employed in this study, the MLP framework. A detailed explanation of the framework is provided, along with an introduction to the R frameworks within the context of circular economy practices.

Section four is dedicated to the research design, including the sample selection process, data collection methods, and data analysis techniques. This section outlines the specific methodology utilized in the study. The analysis and discussion section, encompassed within chapter five, analyzes the role of start-ups in implementing and developing the CE utilizing the MLP framework. The challenges these start-ups encounter are also discussed to address the second research question. This section draws upon the collected data, presenting the study's main findings. Lastly, chapter six serves as the conclusion of the thesis, summarizing the key findings and providing recommendations for future research endeavors.

2. Literature review

The literature review section of this study provides an overview of the CE across various contexts, sustainability transitions, and previous studies on start-ups as the driving force of CE. The literature on CE provides insights into its applicability in different settings, while the discussion of sustainability transitions enhances the understanding of the broader societal context and potential for transformative change. Previous studies examining start-ups contribute to a deeper comprehension of their role in transitioning towards CE. By encompassing these literatures, this section establishes a solid foundation, facilitates contextual understanding, and identifies research gaps, thus providing the necessary background knowledge for this study.

2.1. Circular economy

2.1.1. Global context

According to the World Bank (2022), the global economy has experienced a significant increase in material extraction and use due to industrialization and rapid growth over the past century. Between 2000 and 2015, the amount of material extracted in that time is equivalent to half of what was extracted in the previous 100 years. Adopting circular economy strategies can significantly contribute to reducing global greenhouse gas emissions by up to 39%, which is a critical step in preventing climate breakdown (Circle Economy, 2021).

Despite this, the demand for virgin materials is projected to double again by 2050. Unfortunately, the global circularity of the economy is deteriorating year by year. The circularity rate, which assesses the percentage of secondary materials obtained from waste that are reintroduced into the economy, was initially recorded at 9.1% in 2018. However, it has experienced a decline to 8.6% in 2020, and as of 2023, it has further decreased by 1.4% to reach 7.2% (Circle Economy, 2023). This decline cannot be solely attributed to insufficient recycling efforts but is also influenced by an increased extraction of virgin resources and the accumulation of materials in infrastructure, buildings, and durable goods.

Given the urgency and importance of transitioning towards a more circular economy, numerous efforts have been undertaken to replace the traditional linear economic model. However, the degree of progress in implementing CE practices varies significantly between countries. Japan stands out as a pioneer in CE efforts, with

initiatives dating back to the 1990s. Subsequently, the European Union (EU) and its member states have played a leading role in promoting the CE agenda globally, driving progress forward to the present day (Weick et al., 2022).

Ghosh (2020) conducted a study on the implementation of the Circular Economy (CE) in twenty countries between 2017 and 2021, which resulted in the identification of four distinct groups based on their level of implementation. The first group is characterized as the "mature-driven society," comprising countries that have achieved significant progress in implementing CE practices, such as Germany and Norway. The second group is referred to as the "progressive CE-driven society," consisting of countries that have been practicing CE for an extended period but have limited results, or those that have recently started CE activities but have achieved significant outcomes. Examples of countries in this group include Australia, Canada, China, and the United States. The third group is labeled as the "Initiated CE-driven society," including countries that have recently initiated CE activities, such as Bhutan and Vietnam. Additionally, Indonesia can also be categorized in this group considering its current development in this area. The final group encompasses countries that have not yet initiated any efforts to promote CE, and if there are any, they are only at an individual level.

2.1.2. Asia context

In Asia, Japan and China stand out as the only two countries that have formally integrated circular economy practices into their systems (Ghisellini et al., 2016). Japan holds the distinction of being the first country to establish dedicated legislation for the circular economy. Remarkably, Japan has achieved a recycling rate of 98% for metals as of 2007, with a mere 5% of waste being sent to landfills (Ogunmakinde, 2019). The successful transition to a circular economy in Japan was facilitated by collaborative efforts between producers and consumers, supported by robust legal frameworks and top-down approaches (Yolin, 2015; Ogunmakinde, 2019). Given its achievements, Japan can be categorized as a "mature-driven society" according to Ghosh's classification (2020).

On the other hand, China falls under the category of a "progressive CE-driven society" in Ghosh's typology (2020). China has implemented two key strategies to establish a circular economy. The first involves promoting cleaner production within ecological industrial parks, while the second focuses on waste recycling through urban mining demonstration bases (Zeng & Li, 2020). Notably, the Chinese government's approach to managing small and medium-sized enterprises (SMEs) has evolved over time, transitioning from a primary focus on economic growth to enacting laws and regulations aimed at regulating and mitigating their environmental impact.

The pursuit of CE practices in Southeast Asia demonstrates both shared and disparate attributes among Malaysia, Vietnam, and Thailand. It's noteworthy that despite their differences, these countries share common ground in their early-stage progress in transitioning towards CE, with each classified as an "Initiated CE-driven society" by Ghosh (2020). This phase of development characterizes the emerging nature of CE efforts within the region and reveals the shared challenges each nation faces in terms of establishing a comprehensive legal framework to regulate and guide CE practices.

The similarity in each country's stage of CE development becomes more evident when scrutinizing their individual approaches. Malaysia, as observed by Agamuthu and Mehran (2020), has demonstrated progress in CE via firm-level initiatives due to the lack of a legal framework. The country has made strides through certain regulations and strategic plans such as the Environmental Quality Act and the Eleventh Malaysian Plan, respectively. However, the absence of explicit top-down and bottom-up approaches reflects the shared need with other countries to strengthen the supporting infrastructure for CE.

Vietnam, although comparable to Malaysia in terms of lacking legislative recognition of the CE concept, seems to adopt an opportunistic approach towards CE. As reported by Hai et al. (2020), while waste recycling and reuse are prevalent in Vietnam, these practices are more profit-driven than sustainability-oriented. Unlike Malaysia's regulatory-driven strategy, Vietnam faces the unique challenge of aligning recycling and reuse activities within a sustainable CE framework.

Contrastingly, Thailand's approach towards CE, identified by Tangwanichagapong et al., (2020), leans towards the '3R' concepts with limited emphasis on sub-sectors such as product transformation and collaborative consumption. Although there's an observed government support for greener production and purchasing, the involvement is exclusively from governmental entities, exposing a lack of local and household participation. The need for more inclusive participation reflects a shared challenge with Malaysia and Vietnam in promoting a bottom-up approach for CE implementation.

While these countries have recently begun their circular economy initiatives, there is still a lack of a comprehensive legal framework from the government to guide and regulate these practices. Despite this, each country has started promoting CE in their own ways, which is a positive step towards sustainability transitions from linear to CE.

2.1.3. Indonesia context

Similar to other countries in Southeast Asia, Indonesia faces significant challenges in the implementation of CE practices, as pointed out by Fatimah et al. (2020). One of the biggest hurdles is waste management, including collection, transportation,

processing, and landfill dependence. The waste management problem in Indonesia can be attributed to various factors, including a high volume of waste generated, inadequate service management, a scarcity of landfills and waste management institutions, and cost-related issues (Bahraini, 2022). Traditional and conventional waste management systems, such as open dumping, transfer, collection, and landfill, still prevail, and a sustainable waste management system is not yet established in Indonesia (Fatimah et al., 2020).

Although the 3R concept emerged in the 1990s, Indonesia only recently started implementing waste bank principles. However, waste banks only manage a small portion of the total waste generated, treating merely 1.7% of the waste generated in 2018 (BPS, 2019). To implement circular economy practices, waste should be sorted at the source, cleaned, and dried to ease the recycling process. A Government Regulation enacted in 2012 addresses household and household-like waste management. However, the majority of Indonesian citizens do not sort their waste (Aprilia, 2021).

At an institutional level, the Indonesian government has enacted regulations specifically aimed at the management of plastic waste. As part of its environmental initiative, the government has implemented strategic measures designed to forestall pollution, promote the development of low-carbon waste management solutions, and enhance environmental and disaster resilience. These actions are encapsulated within the Indonesian Medium-Term Development Plan (RPJMN) for the years 2020 to 2024, falling under the purview of National Priority 6 (Bappenas, 2021).

Further demonstrating a positive trajectory towards a more sustainable future, the Indonesian government is actively promoting the concept of a circular economy (CE) within the country. At present, Bappenas is in the process of constructing a comprehensive national roadmap for the implementation of the CE model. This roadmap is projected to be incorporated into the forthcoming RPJMN, spanning the years 2025 to 2029 (Bappenas, 2021).

In a study conducted by Pambudi and colleagues (2023), it was revealed that Indonesia is employing both top-down and bottom-up strategies to promote the circular economy model. A top-down approach is exemplified by the enforcement of plastic bag levies. However, this initiative has encountered difficulties, largely attributed to issues concerning law enforcement and infrastructural deficiencies. On the other hand, a bottom-up strategy is manifesting itself through the emergence of environmentally-conscious businesses. These entities are motivated by a collective goal to protect and sustain the local ecosystem.

Examining diverse cases of the CE in various contexts provides evidence of its growing significance as an issue that demands attention and action. According to Geissdoerfer et al. (2017), CE practices are seen as a pathway towards achieving sustainability transitions. In

essence, the CE, by decoupling economic activity from the consumption of finite resources and designing waste out of the system, can be a potent catalyst for sustainability transitions.

2.2. Sustainability transitions

The concept of sustainability transitions has gained significant attention in recent years as a means to achieve sustainable development. According to Markard et al. (2012), sustainability transitions involve complex and far-reaching changes in social and technological systems, aimed at shifting from current modes of production and consumption to more sustainable alternatives. These changes are typically long-term and multi-dimensional. In this context, transition refers to the movement or transformation of socio-technical systems, which involves more than just the introduction of new technologies. It also encompasses changes in user behavior, market dynamics, policy frameworks, cultural attitudes, and governing institutions, as part of a broader system innovation (Geels et al., 2008; Coenen et al., 2012). Geels and Schot (2010) define transition with several different characteristics; changes in socio-technical systems that involve multiple elements, interactions between different actors, radical transformation in terms of scope, and long-term processes spanning 40-50 years.

Building on this understanding of sustainability transitions, several studies have started to explore the potential of shifting to CE from linear economy. The CE is a systemic approach that aims to redefine growth, focusing on the benefits for the whole society. It involves the gradual separation of economic activity from the consumption of limited resources and the elimination of waste through thoughtful system design (MacArthur, 2013). In this context, sustainability transitions can be conceptualized as shifts towards CE systems.

Stahel (2016) proposes that a transition towards a CE involves a significant shift in the way resources are used and valued. This implies changes not only at the technological level, but also in business models, consumption patterns, policy frameworks, and cultural norms. These elements align with the multi-dimensional nature of sustainability transitions as described by Markard et al. (2012). Moreover, the circular economy's inherent focus on system-level changes, such as the reconfiguration of value chains and the fostering of closed-loop processes, parallels the system innovation perspective in sustainability transitions theory.

However, a transition towards a CE is not without challenges. Korhonen et al. (2018) identified barriers that include the lack of supportive policy frameworks, market failures, and entrenched behaviors and practices. To overcome these, they suggest a need for greater emphasis on policy innovation, stakeholder collaboration, and the development of new business models that align profitability with sustainability. This

implies the need for more active management of the transition process (Smith and Raven, 2012).

2.3. Start-ups as the driving force of circular economy

Start-ups are recognized as playing a significant role in the promotion and introduction of disruptive sustainable innovations in the market (Fichter and Weiß, 2013). They have a unique advantage in that they can develop and implement innovative business models based on the principles of the CE from the outset (Henry et al., 2020; Ostermann et al., 2021). Zhou et al. (2023) also acknowledge that start-ups tend to be more responsive to emerging opportunities and willing to take risks, making them more likely to adopt radical and transformative business models from the beginning, and playing a pivotal role in driving the transition towards CE.

Hockerts and Wüstenhagen (2010) argued that start-ups, commonly known as "Emerging Davids," are more likely to engage in sustainable entrepreneurship than established companies, referred to as "Green Goliaths." This is due to their agility in trying out innovative approaches and their credibility as a solution for the problems caused by large firms. In contrast, large corporations tend to focus on incremental innovation (Fichter and Weiß, 2013), prioritizing investing in new products and technologies rather than innovating business models (Chesbrough, 2010; Zhou et al., 2023). Consequently, the CE initiatives of large incumbents typically concentrate on end-of-life management and sourcing, rather than circular product design and business models (Henry et al., 2020; Zhou et al., 2023).

However, Riandita (2022) identified an emerging trend of collaboration between sustainability ventures and large incumbents to promote sustainable efforts. This suggests that while start-ups may be more likely to initiate the radical innovation, there is potential for larger corporations to adopt these practices through partnerships and collaborations with sustainability-focused ventures.

In regards to CE start-ups, recent studies have demonstrated the potential of these ventures in driving the transition towards a more sustainable economy. Bauwens et al., (2019) conducted a study on CE start-ups in the Netherlands and found that these start-ups exhibit higher levels of circularity compared to larger firms, indicating their potential to accelerate the transition and engage in circular innovation. Similarly, a study in Finland revealed that start-ups have the potential to disrupt existing institutions and trigger them to adopt CE practices (Närvänen et al., 2020).

Zhou et al. (2023) conducted a study analyzing the role of CE start-ups in driving the transition towards a circular economy in the United Kingdom and China. The authors found that CE start-ups are well-positioned to drive the transition due to their ability

to develop innovative business models rooted in circular principles and their willingness to take risks.

In Indonesia, Kurniawan et al. (2022) highlighted the role of start-ups in promoting waste management and enabling local communities to participate in the CE through digital transformation. Together, these studies demonstrate the significant potential of start-ups in promoting and accelerating the transition towards a more sustainable and circular economy.

2.4. Research gap

The adoption of CE can serve as a significant tool in addressing the ongoing challenges posed by the crises of climate change, biodiversity loss, and pollution. Start-ups play a vital role in driving the CE due to their agility, innovation, and entrepreneurial spirit, which enable them to develop and implement sustainable business models. However, despite the growing importance of the CE and the potential role of start-ups in promoting it, there is a significant knowledge gap in the literature regarding the involvement of start-ups in the CE context, particularly in Indonesia. Closing this knowledge gap is crucial because transitioning to a CE in Indonesia holds significant potential for generating economic, social, and environmental benefits.

To address this knowledge gap, this study aims to investigate the factors that drive start-ups' involvement in the CE, the impacts they have, as well as the challenges they face. To the best of our knowledge, limited research has been conducted discussing the role of start-ups in driving CE in Indonesia. The findings of this study can provide insights into the factors that enable start-ups' involvement in the advancement of CE, the impacts they have, as well as the challenges they face. Additionally, this study can inform strategies and initiatives that can support the efforts of start-ups in promoting the CE, thus contributing to the advancement of sustainability transitions from linear to CE in Indonesia.

3.Theoretical Approach

This chapter presents the theoretical approach of the thesis by exploring the Multi-Level Perspective (MLP) and the 9R framework of Circular Economy (CE). The MLP framework, with its three interconnected levels—niche, regime, and landscape—serves as a tool to elucidate how start-ups, as niche innovations, contribute to CE development within Indonesia's specific socio-technical regime and landscape. Critiques of the MLP framework will also be considered for a balanced understanding of its application. Subsequently, employing the 9R framework will enable us to capture start-ups' diverse, innovative CE practices beyond traditional waste reduction strategies. Collectively, these frameworks provide a nuanced perspective to explore the dynamic role of start-ups in fostering sustainable transitions in Indonesia, thus aiding in answering the research question.

3.1. Multi-level Perspective (MLP) Framework

The Multi-Level Perspective (MLP) is a theory that helps to explain the overall patterns and trends in the changes that occur as a society moves from one technological system to another. It focuses on the socio-technical aspects of these transitions and provides a framework for understanding how they unfold over time (Geels, 2011). Hence, it is an approach to deal with the complex challenge of sustainability transitions (Falcone, 2014). According to Coenen et al. (2012), the MLP is an amalgamation of theoretical frameworks that combine science and technology studies and evolutionary economics perspectives. It heavily relies on institutional analysis as a middle-ground to connect these two traditions.

According to the Multi-Level Perspective (MLP), transitions occur due to the interplay between processes occurring at various levels (Grin et al., 2010). Geels (2002, 2011) explains that MLP includes three levels: the landscape, the regime, and the niche level (see Figure 1).

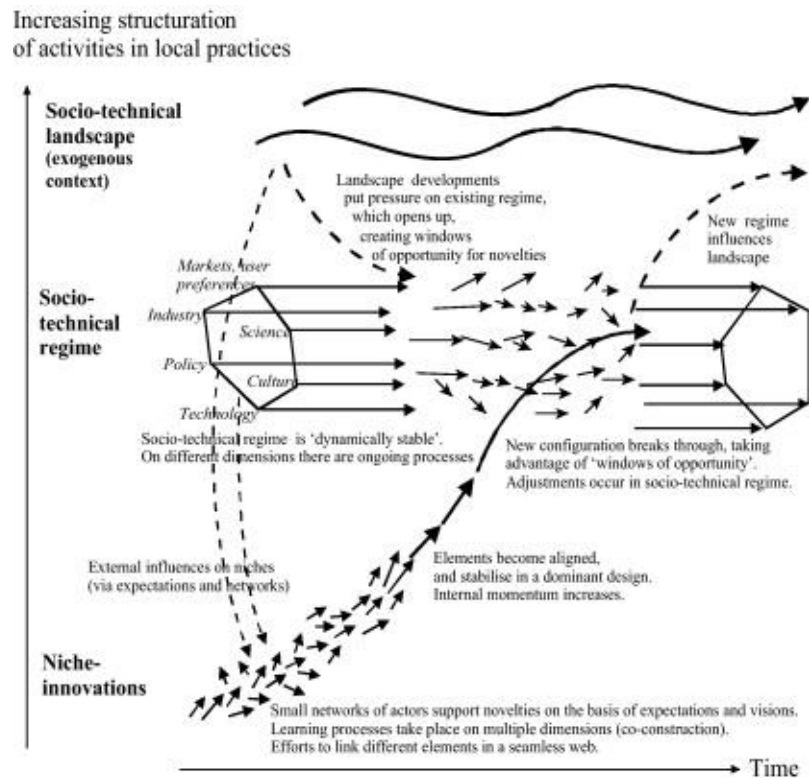


Figure 1. The Multi-level perspective (Geels, 2011)

a. Landscape

At the landscape level, the MLP looks at the broader societal context in which change occurs slowly (Geels, 2002). In socio-technical systems, the landscape level refers to the broader setting that encompasses abstract social values, political beliefs, and concrete elements such as market institutions and functions like prices, costs, trade patterns, and incomes (Geels, 2011; Falcone, 2014). It also represents exogenous trends and developments, such as broad political ideologies, macroeconomic patterns, cultural and societal values, and environmental changes (Geels, 2010). Thus, it comprises the various elements or factors that can notably influence the regime and the niche level. Generally, changes at the landscape level tend to be slower than those at the socio-technical regime level (Geels, 2011).

The landscape level will be used to identify broader societal trends and drivers of change that shape the context for sustainability transitions.

b. Regime

At the regime level, the framework looks at the dominant institutions and practices that shape a particular system, including the rules, norms, and governance structures (Geels, 2002; Geels, 2011). This level consists of three interconnected components: a network of actors and social groups that adapt to system dynamics, a set of rules that govern the actions of actors to guide the socio-technical system, and a set of material and technological components. These elements maintain and guide the established

system's evolution (Falcone, 2014). Innovation within an established regime tends to align with existing technologies and typically involves incremental improvements rather than radical change (Geels, 2002).

The regime level will identify policies and institutions that support or hinder these sustainability transitions. This will involve analyzing the regulatory environment for start-ups in Indonesia and the policies and incentives that encourage circular economy practices.

c. Niche

The term "niche" often refers to a protected space or specific environment in which radical innovations can develop without the influence of the dominant socio-technical regime as a means of shielding them from its selective pressures (Kemp et al., 1998). At the niche level, the MLP looks at the experimentation and innovation happening within a particular system. It includes new technologies, business models, and social practices that may challenge the regime (Geels, 2011).

This study will use the niche level to identify innovative start-ups that are driving sustainability transitions in Indonesia. This will involve analyzing the characteristics of successful circular economy start-ups in Indonesia, such as their business models, technology innovations, and strategies for scaling up.

By utilizing the MLP framework, this study will provide a comprehensive understanding of the socio-technical factors that impact the success of start-ups in promoting circular economy practices in Indonesia. This will enable the identification of potential policy interventions that can support the efforts of CE start-ups in Indonesia and contribute to developing a more sustainable economy.

3.1.1. Interaction between levels

The interaction between the landscape, regime, and niche levels in the MLP framework is a dynamic process that shapes sustainability transitions. Each level influences the others, leading to a complex interplay that drives transformative change (Geels & Schot, 2007).

Landscape pressures are external shocks or changes in the broader environment that create opportunities for sustainability transitions. These pressures can originate from various sources, such as global environmental issues, demographic shifts, technological breakthroughs, or changes in cultural values. Landscape pressures expose the incumbent regime's weaknesses and vulnerabilities, creating windows of opportunity for niche innovations to emerge and challenge the status quo (Geels, 2005).

Next, according to Smith et al. (2010), niche innovations represent radical alternatives to the dominant regime, often embodying more sustainable practices and

technologies. The interaction between niches and the regime is crucial for sustainability transitions. As niche innovations mature, gain support, and demonstrate their potential, they may begin to challenge the incumbent regime.

The dominant regime, often characterized by stability and inertia, may respond to these pressures and challenges differently. They can adapt by incorporating some aspects of the niche innovations, leading to a more gradual transition. Alternatively, regimes may resist change by strengthening their position by delaying or blocking the sustainability transition (Geels, 2005).

The transition pathways can be elaborated as the interplay between landscape, regime, and niche levels results in various potential pathways for sustainability transitions. These pathways can be described as trajectories that the socio-technical system follows over time, reflecting the cumulative effect of the interactions between the different levels. Transition pathways can be characterized as more incremental or transformative, depending on the degree of change and the pace of the transition (Geels & Schot, 2007).

The arrows within the MLP diagram (Figure 1), which appear to be moving in all directions, symbolize the complex and dynamic nature of the interactions among these levels. For instance, landscape pressures could destabilize the regime, creating windows of opportunity for niche innovations to scale up and become mainstream. Alternatively, successful niche innovations could influence regime and landscape levels, effecting broader systemic changes (Geels & Schot, 2007).

The interaction between the landscape, regime, and niche levels in the MLP framework is a complex and dynamic process that drives sustainability transitions. Landscape pressures create opportunities for niche innovations to emerge and challenge the incumbent regime. The regime's response to these challenges, whether through adaptation or resistance, shapes the overall trajectory of the transition. By understanding these interactions, we can identify levers for change and develop strategies to accelerate the shift towards more sustainable socio-technical systems (Loorbach, 2010).

3.1.2. MLP on sustainability transitions

The MLP is frequently employed in analyzing sustainability transitions. Köhler et al. (2009, 2010) focused on the hydrogen-fuel cell transition in mobility, while Nykvist and Whitmarsh (2008) investigated mobility systems in the UK and Sweden. They found that short-term adoption of radical technological innovations like hydrogen or electric vehicles was hindered by economic and infrastructural barriers at that time. El Bilali (2019) discussed MLP's application in sustainability transitions within the agriculture industry and food systems, and Næss and Vogel (2012) used MLP to analyze Denmark's transition towards sustainable urban development.

In the global south, Oates (2021) demonstrated how MLP could illustrate the positive impacts of waste management and solar energy innovations by non-governmental entities. These innovations can enhance service accessibility, reduce ecological footprints, and empower socially excluded groups, despite challenges such as poverty, informality, and limited institutional capacity. Osunmuyiwa et al. (2017) also utilized MLP to identify renewable energy transitions in Nigeria. In Asia, Smits (2011) focused on energy transitions in Laos using MLP, while Marquardt (2014) examined the Indonesian government's role in driving the shift to renewable energy. Additional studies on MLP in Asia suggest the potential for further research to expand our understanding of MLP's applications in the region.

MLP is also particularly valuable in understanding the processes of transitioning to CE. Several studies have adopted MLP to investigate CE and its practices, such as Jackson et al. (2014) on Australia's metal sector transition, Finn et al. (2020) on renewable energy transition due to the niche's radical innovation in Scotland, and Zhu et al. (2022) on the role of Small and Medium Enterprises in a CE transition.

In conclusion, making CE happen requires substantial shifts in socio-technical systems aligned with the characteristics of sustainability transitions. The transition towards sustainability is a complex and challenging process, requiring a multi-faceted approach. When studying the dynamics of innovation in sustainability transitions, MLP has been widely used as one of the conceptual frameworks (Markard et al., 2012; Coenen et al., 2012).

3.1.3. Criticism of MLP

While the MLP is widely used to analyze sustainability transitions, it is not without its critiques. Scholars have pointed out several potential weaknesses and limitations of the framework in this context. However, acknowledging these concerns also offers opportunities to improve its application and relevance, particularly for the current study.

Firstly, criticisms of the MLP's limited treatment of agency and power dynamics are significant (Smith et al., 2005; Avelino & Rotmans, 2009). However, this study addresses the active roles of different actors and the power dynamics. Although traditionally underemphasized in the MLP framework, our research highlights these aspects, particularly by focusing on the role of start-ups (as agents of change) and the government (as an influential regime actor). This approach allows for better capture of the complex social and political dynamics of the transition to CE.

Secondly, the MLP's conceptualization and operationalization of the landscape level have been critiqued for their vagueness (Holtz et al., 2008). However, this general nature can be seen as an advantage for this study. A broad understanding of the landscape allows us to incorporate various external influences, including cultural

norms, macroeconomic trends, or global environmental challenges. These are particularly relevant for understanding the societal transition towards a CE. This flexibility provides room to capture the extensive range of influences on the transition dynamics in the Indonesian context.

3.2. The Rs Framework in Circular Economy

The concept of CE presents a revolutionary paradigm shift from the traditional linear economy, offering a sustainable approach to resource management that fundamentally reconsiders our production and consumption patterns (Geissdoerfer et al., 2017). Various "R" frameworks, from 3R to 9R, have been conceptualized to provide tangible guidelines for implementing the principles of the CE (Reike et al., 2018). These frameworks are often perceived as a "how-to" guide (Kirchherr et al., 2017) for implementing the principles of CE.

The inception of this evolutionary progression began with the basic 3R principles: "Reduce," "Reuse," and "Recycle," which advocated for a reduction in the use of resources, the reuse of products, and the recycling of materials (Ghisellini & Ulgiati, 2020). This foundational framework served as a stepping stone for the development of the more sophisticated 4R model, which included the principle of "Recover." This principle focused on the extraction of valuable elements from waste, promoting energy recovery processes (Hu et al., 2011).

The 5R framework expanded upon its predecessor by incorporating the principles of "Rethink" and "Repair" alongside the original 3Rs. The inclusion of "Rethink" emphasized the necessity of reassessing our current production and consumption models, whereas "Repair" encouraged the mending of damaged products to extend their lifecycle (Wenbo, 2011). The 6R framework subsequently emerged, augmenting the 5R framework by introducing "Remanufacture." This principle encourages restoring products to their original specifications, thus preserving the value of the resources initially used in production (Sihvonen & Ritola, 2015).

Further attempts to encompass the broad spectrum of CE principles led to the development of the 7R, 8R, and 9R frameworks. These advanced models introduced new principles such as "Refuse," "Refurbish," "Repurpose," and "Recover," each contributing to a more holistic and comprehensive approach to resource management (Potting et al., 2017). The principle of "Refuse" encourages conscious consumption, advocating for avoiding unnecessary products or services. "Refurbish" promotes renovating used or obsolete products, extending their usable lifespan. "Repurpose" calls for innovative utilization of waste or by-products, finding new applications for materials otherwise deemed as waste. Lastly, the principle of "Recover" emphasizes the importance of recapturing the maximum value from waste, either as material or energy (Potting et al., 2017). Moreover, the 9R frameworks are usually written in

order of priority, such as R0 Refuse, R1 Rethink, R2 Reduce, R3 Reuse, R4 Repair, R5 Refurbish, R6 Remanufacture, R7 Repurpose, R8 Recycle, R9 Recover (Potting et al., 2017).

Despite its comprehensive nature, the application of the 9R framework is less widespread than the 5R or 6R frameworks in practice. This is due to the greater complexity and effort required to implement the more extensive "R" frameworks, as highlighted by Reike et al. (2018). The higher-order R's (from 7R to 9R) necessitate more systemic changes at the societal and industrial level, as Zink and Geyer (2017) argued. These changes encompass policy reforms, technological advancements, and shifts in consumer behavior, further complicating the implementation of the broader frameworks, as noted by Ghisellini et al. (2016). However, recent documents from Bappenas (2022) state that Indonesia is utilizing the 9R framework in developing its CE initiatives. Therefore, for this study, the 9R framework will also be employed. In conclusion, the "R" frameworks provide a valuable roadmap for implementing CE principles, each offering varying complexity and comprehensiveness.

4. Methodology

This section offers an overview of the research design and approach adopted for this study, highlighting the use of semi-structured interviews and document review. These methodologies were selected to ensure a comprehensive and nuanced understanding of the topic, utilizing existing documents and gathering firsthand insights from key stakeholders. Furthermore, a detailed account of the data analysis procedure is provided, along with a discussion of the associated research limitations.

4.1. Data collection

4.1.1. Overall research design

This study utilized a qualitative research method to explore the role of start-ups as the driver of the circular economy in Indonesia. The main framework employed in this study is the MLP proposed by Geels (2002), which considers three levels of analysis: regimes, landscape, and niche. Data collection for each level will involve a combination of document reviews and semi-structured interviews with relevant stakeholders.

A review of existing documents was conducted to capture the government's perspective and establish the contextual background to understand the topic comprehensively. Additionally, semi-structured interviews were conducted to explore the regimes and landscape levels. The selection of semi-structured interviews is justified by their versatility and flexibility, as highlighted by Kallio et al. (2016). Moreover, using identical questions across interviews enables meaningful comparisons (Panke, 2018), while incorporating follow-up questions based on initial responses allows for more in-depth and comprehensive insights (Rubin & Rubin, 2012).

4.1.2. Document review

The methodology employed for this study incorporated the document review method, a systematic approach involving the examination and analysis of extant literature, reports, policy documents, and relevant studies concerning the circular economy (CE) and the start-up ecosystem in Indonesia (Bowen, 2009). This method was mainly employed to investigate the role of start-ups as drivers of the CE in Indonesia, with a specific focus on the current government's role and policies.

An examination was conducted on various governmental publications, encompassing policy documents, regulations, and reports pertinent to the CE. This examination aimed to pinpoint the distinct roles undertaken and actions implemented by the government in its support of CE practices (Hsieh & Shannon, 2005). This analysis involved an assessment of policies related to waste management, resource efficiency, support for innovation, funding mechanisms, and collaborative initiatives (Yin, 2018).

Through the document review process, the research aimed to amass a holistic understanding of the government's present stance, strategies, and initiatives concerning CE (Hartley, 2004). The findings from this methodological approach were instrumental in discerning the intricate dynamics between start-ups and the CE, shedding light on the potential for sustainable economic development in Indonesia.

Table 1. List of documents

Document / Policy Report	Source	Year
Presidential Decree no 59/2017	Indonesia Government	2017
Roadmap of SDGs Indonesia Towards 2030	Bappenas	2019
The National Medium-Term Development Plan for 2020 - 2024	Bappenas	2020
Green Recovery Roadmap Indonesia 2021 - 2024: Building Back Better Low Carbon Development Post-COVID19	Bappenas	2020
The Economic, Social, and Environmental Benefits of a Circular Economy Indonesia	Bappenas	2021
Indonesia's Voluntary National Review (VNR): Sustainable and Resilient Recovery from the COVID-19 Pandemic for the Achievement of the 2030 Agenda	Bappenas	2021
The Future is Circular: Uncovering Circular Economy Initiatives in Indonesia	Bappenas	2022

4.1.3. Semi-structured interviews

The interviews were conducted at two levels: the landscape and the niche. The respondents were selected from organizations focusing on the external context, which influences both the regime and the niche as part of the landscape. The niche-level respondents were specifically drawn from CE start-ups in Indonesia.

A total of five interviews were conducted between April and May. Two methods were employed to send the invitations through email and LinkedIn messages to secure these interviews. Out of all the invitations sent, eight respondents responded, and five could

participate in the interview. One respondent represented the landscape level, while the remaining four represented the niche level. The profile of the landscape-level respondent can be found in Table 2. For more comprehensive information, please refer to Appendix B.

Table 2. Landscape-level respondent's profile

Code	Organization	Respondent's Position
L1	International organization based in Indonesia	Project Manager for Circular Economy

In selecting the targeted start-ups for this research, two different criteria were employed: the sectors and the level of circularity in their businesses. According to a joint report released in 2021 by Bappenas, the Denmark Embassy, and UNDP Indonesia, five sectors represented approximately one-third of Indonesia's GDP. They possessed significant potential for adopting a circular approach. These sectors include food & beverage, textiles, construction, wholesale & retail trade, and electrical & electronic equipment.

This study utilized the 9R Framework developed by Potting et al. (2017) to measure the start-ups' circularity. The chosen start-ups had to belong to the previously mentioned sectors and incorporate at least one of the R's from the framework into their business model.

The following table presents information regarding the respondents' information at the niche level (see Table 3). For a more comprehensive table, please refer to Appendix B.

Table 3. Niche-level (start-ups) respondents' profile

Code	Business Model	Established	Sector	Respondent's Position
N1	Offers household products refills directly to the consumers' door	2019	Wholesale & retail trade	Chairwoman, Advisor, and Co-Founder
N2	Produce construction materials made from plastic waste	2018	Construction	COO/ Co-Founder
N3	A dress rental service for occasional events	2019	Textile	Co-Founder
N4	Waste management and recycling services	2018	Multisector	COO/ Co-Founder

The study utilized online interviews as its primary method of data collection, employing either Zoom or Microsoft Teams, depending on the availability and preference of the participants. The interviews were conducted in Bahasa Indonesia or English, depending on the participants' preferences. To ensure accurate and complete data, all interviews were recorded and transcribed as part of the data-management process (Panke, 2018).

A qualitative approach was employed to analyze the collected data, specifically using thematic analysis. This method involved identifying and coding emergent themes within the data and organizing the data into categories based on these themes. The identified themes were then utilized to address the research question (Smith, 2015).

4.2. Data analysis

4.2.1. Coding framework

This study used a systematic approach to analyzing the qualitative data collected from the interviews. A crucial component of this approach was coding, a process of categorizing and organizing the data in a meaningful and helpful way (Saldaña, 2015). Coding was executed using NVivo, a qualitative data analysis software.

NVivo was chosen for this study due to its ability to handle and facilitate the analysis of large volumes of complex data. It supports deep data analysis and exploration levels, thereby providing robust findings (Bazeley & Jackson, 2013). The software is also designed to maintain the transparency and rigor of the research process, which is paramount in enhancing the credibility and reliability of the study (Sinkovics & Alfoldi, 2012).

The coding process in NVivo was carried out in several steps. First, the transcribed interview data were imported into the software. However, only four transcribed data are available, as one of the respondents disagreed to be recorded. This raw data was then read thoroughly to familiarize the content, in line with Braun and Clarke's (2006) suggestion that researchers immerse themselves in the data.

The first coding cycle involved generating 'open codes' from the data. Open coding, according to Charmaz (2006), is the initial step of coding, where data is broken down analytically. At this stage, I annotated text segments that were found to be pertinent or interesting using descriptive labels. This process allowed for identifying emerging themes and subthemes relating to start-ups' contributions to the CE in Indonesia. In the second cycle, I created 'nodes,' which are collections of references about specific themes. It allowed me to refine and categorize the initial open codes into broader themes (Saldaña, 2015).

NVivo, in this study, was crucial in enabling a structured, systematic, and rigorous approach to data analysis. It was possible to uncover and articulate the intricate relationships and dynamics within the data through the coding process, contributing to a robust understanding of the research question.

4.3. Limitations

Qualitative research, particularly when implementing a semi-structured interview method, is associated with several inherent limitations, which must be acknowledged to appreciate the scope and validity of the findings.

The first notable constraint pertains to time and resources. Due to its in-depth nature, the qualitative research process can be labor-intensive and time-consuming for both the researcher and the participants. The researcher often has to dedicate significant effort to schedule interviews, transcribe conversations, code data, and analyze the resulting information, while participants must allot time to participate in the interviews (Bryman, 2016). Hence, this study's scope might be limited by the number of interviews that can be feasibly conducted within the time period and given these constraints.

The potential for bias is another limitation inherent in qualitative research. Researcher bias can occur during the data collection, coding, and analysis phases, mainly when the researcher's preconceptions and interpretations influence the process (Oleinik et al., 2013). Similarly, participant bias might arise due to various factors, including their ability to recall and articulate their experiences, their willingness to provide truthful responses, or their interpretation of the researcher's questions (Creswell, 2014). A conscious effort to mitigate bias, including reflexivity in the research process and triangulation of data, will be undertaken to enhance the validity of the findings.

Lastly, a common challenge in qualitative research is the limited generalizability of the findings. Due to the focus on a small, non-representative sample, the outcomes of this study may not be directly applicable to a larger population or different contexts (Gibbs, 2007). This limitation is particularly relevant when studying specific entities, such as start-ups in Indonesia, as their experiences may differ from those of start-ups in other countries or sectors. Furthermore, even within Indonesia, the diversity of start-ups, sectors, and regions might limit the findings' generalization. Therefore, the results of this study should be interpreted as providing in-depth insights into the selected sample rather than offering universally applicable conclusions. However, such insights can contribute to the broader understanding of how start-ups can drive the transition towards a circular economy, informing future research and policy-making in this area.

5. Analysis and discussion

This chapter presents the findings of the research, commencing with an analysis of the first research question based on the data collected. It delves into the factors that have facilitated the role of start-ups in driving the CE and explores their impact on CE practices. Additionally, the chapter addresses the second research question by shedding light on the challenges encountered in promoting CE efforts. Then, an analysis of the findings by utilizing MLP is also presented. With this framework, the dynamics and complexities of transitioning from linear to CE can be identified. Through a comprehensive examination of the gathered data, this chapter offers valuable insights into the pivotal role of start-ups in driving the CE, as well as the barriers and difficulties they encounter in their endeavors to promote CE practices.

5.1. Start-ups' enablers in driving CE

Based on the employed research method in this study, several factors have been identified as enablers for start-ups. The identification of these enablers allows for a comprehensive exploration of the conducive environment and factors that these start-ups leverage for their development. This, in turn, contributes to the advancement and implementation of CE practices in Indonesia.

5.1.1. Market forces

Market forces serve as a potent catalyst, fostering the growth of CE start-ups in Indonesia. This study's findings illuminate that shifting consumer preferences and escalating demand for sustainable goods and services substantially influence the success trajectory of these start-ups.

N2 and N4's experiences echo this phenomenon, demonstrating that consumers embrace their sustainable products and services without relying heavily on extensive marketing efforts. For instance, N4 remarked, "Our business adopts a passive approach, characterized by a reactive nature. When we receive a phone call or inquiry, we respond accordingly" (N4, Interview, 18 May 2023). N2 mirrors this sentiment, indicating that there was no need for aggressive marketing initiatives for the first two and a half years of operation (N2, Interview, 26 April 2023).

Such observations elucidate that the market is prepared to integrate sustainability into business models; it seeks platforms for participation in promoting sustainability.

Once access is provided, individuals share similar interests in joining these initiatives.

Further supporting this, L1 highlighted the rise of societal initiatives and grassroots movements, indicating heightened public interest in circular economy issues (L1, Interview, 4 May 2023). This mirrors trends outlined by Bappenas (2021), where a gradual shift towards sustainability was observed in various sectors.

5.1.2. Partnership with multiple stakeholders

In today's interconnected business world, partnerships with multiple stakeholders play a vital role in amplifying the impact of circular economy start-ups. The interview data highlights a variety of collaborations with businesses, non-governmental organizations (NGOs), and governmental entities, all of which have proven instrumental in fostering the growth and development of these start-ups.

First and foremost, partnerships and collaborations with established large firms and companies have proven essential for the interviewed start-ups. Start-ups N1, N2, N3, and N4 each leveraged partnerships with established firms to facilitate their operations and create mutually beneficial relationships. This finding aligns with the research conducted by Riandita et al. (2021), which emphasizes that collaboration with incumbents also plays a pivotal role in establishing legitimacy for start-ups. For instance, start-up N1 forged a partnership with fast-moving consumer goods (FMCG) companies to facilitate the supply of household product refills. N1 acknowledged that this partnership had been a key factor in their operational success (N1, Interview, 25 April 2023).

Similarly, start-up N2 engaged in collaborations with prominent firms to acquire waste materials, which they then transformed into construction materials, creating a mutually beneficial relationship where the needs of both parties were met. In the case of N3, collaborating with well-known brands allowed them to expand their product offerings, thereby attracting a broader customer base interested in renting dresses through their platform. Additionally, start-up N4 earned the trust of several large companies by providing waste management services through their business-to-business (B2B) services.

Moreover, collaborations with governmental bodies emerged as critical enablers for start-ups N1 and N4, fostering smooth operations, increasing customer trust, and enabling geographical expansion (N1, Interview, 25 April 2023; N4, Interview, 18 May 2023). In the context of sustainability transitions, the government has actively promoted collaborative efforts among diverse stakeholders since 2017, as mandated by Presidential Regulation (Perpres) Number 59 the Year 2017, which focuses on the implementation of the SDGs (Bappenas, 2021).

The engagement of start-ups N1 and N4 with governmental bodies highlights the significance of public-private partnerships and demonstrates the alignment of their operations with the national agenda for sustainability transitions. By collaborating with government entities, these start-ups are able to leverage the resources, expertise, and support provided by the government, thereby enhancing their effectiveness and impact.

Simultaneously, start-up N2 partnered with NGOs to identify potential development areas indicative of how societal actors at the landscape level can facilitate niche development (N2, Interview, 26 April 2023). Other start-ups expressed gratitude towards NGOs for promoting sustainability practices and broadening the acceptance of CE principles.

5.1.3. Social media use

Social media's rise has profoundly transformed how businesses engage with their stakeholders. For CE start-ups in Indonesia, social media platforms have emerged as a vital tool for enhancing awareness, attracting customers, and cultivating a sustainability-focused community. Start-ups N2 and N4 illustrate the catalytic role of social media in their businesses' evolution, especially during the Covid-19 pandemic. N2, for example, witnessed a surge in non-valuable plastic supply from individuals after a post encouraging the public to drop their plastic waste at N2's facility went viral. This sudden rise in public participation, driven by a single social media post, underscores the profound influence such platforms can have in increasing awareness and engagement with CE principles (N2, Interview, 26 April 2023).

Similarly, N4 recognized the pivotal role of social media in boosting public awareness and fostering business growth during the pandemic. Reflecting on their four-year journey, they attributed their success to social media's reach, stating: "Historically speaking, honestly, the fame and recognition through social media have also brought blessings to the company" (N4, Interview, 18 May 2023).

L1, providing a broader perspective, argues that social media platforms, through their openness and accessibility, have led to an increased public understanding of and engagement with CE principles. This surge in public education and awareness has significantly contributed to the growing prevalence of CE start-ups in Indonesia (L1, Interview, 4 May 2023). This recognition of the role of social media in shaping these CE start-ups' trajectories illustrates the platform's immense potential as a driver of innovation and customer engagement.

5.1.4. Continuous Innovation

Continuous innovation is a fundamental enabler for CE start-ups, acting as a key driver for sustainable growth and competitive advantage. The interviews showed that the studied start-ups share an unwavering commitment to Research and Development (R&D), aiming to innovate their offerings and environmental impact persistently. The innovation efforts align with their overarching goal of incessantly enhancing their offerings to balance customer satisfaction and environmental sustainability, adhering to the dynamic principles of the CE paradigm (Bocken et al., 2016).

N1, for instance, highlighted their ongoing research to devise products addressing consumers' initial problems while integrating these solutions into their existing offerings. This strategy aims to entice individuals further to shift away from single-use plastic sachets. Concurrently, N2 is directing its R&D efforts towards enhancing the circularity of its products by devising methods to recycle or repurpose products post-use. N4, on the other hand, is focused on refining its services and workflows to streamline users' recycling experiences, illustrating the potential for continuous innovation to drive systemic changes in waste management practices (N4, Interview, 18 May 2023).

These niche innovations can serve as catalysts for systemic changes, potentially triggering a shift in the landscape level. The focus on continuous innovation underscores its essential role in the diffusion of CE practices within the broader socio-technical regime. In essence, the start-ups are nurturing an environment that facilitates the propagation of niche innovations into mainstream practices, thus driving the evolution of CE (Geels, 2010).

5.1.5. Technological advancement

Technological advancements are pivotal in advancing the CE paradigm, particularly for start-ups in Indonesia. In the realm of CE start-ups, technology enhances efficiency and serves as a catalyst for innovation and competitive differentiation. Interviews conducted with N3 and N4 underscore this sentiment, demonstrating how technology has simplified and expedited the implementation of sustainable practices.

For instance, N4 has leveraged technology to create a sustainable business model, positioning its business as a technological "bridge." They connect individuals with waste processing facilities, effectively streamlining what was once a complex and convoluted process. This has not only improved their operations' efficiency but also significantly reduced waste accumulation, furthering their CE objectives (N4, Interview, 18 May 2023).

Furthermore, N4 emphasized the role of technological advancements in bolstering their operations and facilitating company growth. Their innovative business model, centered on waste traceability, hinges on the principle of knowing the source and processing destination of every piece of waste they manage. This focus on traceability, made possible by tracking and data management technologies advancements, has become a cornerstone of the start-up's success (N4, Interview, 18 May 2023). N3 also echoed the significance of technology in their business operations, further emphasizing the role of technological advancement in enabling CE start-ups to actualize their sustainability goals and increase their operational efficiency.

5.2. Start-ups' impacts within the context of CE

Next, in this section, the impacts and outcomes of start-ups operating within the context of the CE will be identified. By investigating the implications, a better comprehension can be gained regarding how start-ups contribute to the transition towards CE in the country, moving away from linear economy. Exploring the effects of these entrepreneurial ventures enhances the understanding of their role in driving CE practices.

5.2.1. Environmental impact

The environmental implications of start-ups operating within the CE paradigm play a fundamental role in their overall contributions toward sustainability. An analysis provided by Bappenas (2021) indicates that a circular approach in five focused sectors could yield considerable environmental advantages, potentially reducing waste by 18-52%, decreasing CO₂ emissions by 126 million tonnes, and cutting water usage by 6.3 billion cubic meters by 2030. The start-ups that operate within these sectors in this study contribute actively to this transition from a Business As Usual (BAU) scenario to a CE scenario.

Each start-up participating in this research demonstrates varying degrees of circularity within their respective business models. N1, focusing on plastic waste reduction, exemplifies the R2 Reduce, R3 Reuse, and R8 Recycle principles through its operations. Given the company's growth rate in 2021, it anticipates saving around 77.5 million plastic sachets by 2025 (EPPIC, 2021). On the other hand, N2 leverages the principles of R7 Repurpose and R8 Recycle, successfully converting approximately 10,000 kg of low-value plastic into valuable eco-building materials (N2, Interview, 26 April 2023).

Operating under the R3 Reuse, R4 Repair, and R5 Refurbish principles, N3 is engaged in mitigating textile waste. Conversely, start-up N4, committed to waste management with the principles of R2 Reduce, R3 Reuse, and R8 Recycle, has effectively processed and recycled more than 2.5 million kg of waste while simultaneously tracking their real-time environmental impact (N4, Interview, 18 May 2023).

5.2.2. Economic impact

The economic repercussions of start-up activities in the CE are multifaceted and profound. These start-ups work towards fulfilling their business objectives and stimulate economic growth, generate employment, and contribute to a sturdy and resilient economic ecosystem. Economic performance in this context is evaluated not solely based on profitability but also on the ability to trigger broader economic advantages. A report by Bappenas (2021) forecasts that a CE approach could generate 4.4 million jobs between 2021 and 2030 in the five sectors mentioned.

Examples of how CE practices can stimulate job creation are found in start-ups' N2 and N4 operations. N2, through its waste-to-product model, has empowered local communities surrounding their partner waste facilities by providing training on the production of one of the products they offer. As a result, when there is demand for this specific product, they purchase it directly from the community, fostering local employment and income generation (N2, Interview, 26 April 2023).

Similarly, N4 has formalized previously informal segments within the waste management process. The company has successfully brought former informal waste collectors into its operations, providing them humane working conditions and fair wages (N4, Interview, 18 May 2023).

5.2.3. Social impact

In addition to their environmental and economic impacts, CE start-ups also have significant social implications. The social impact of CE start-ups manifests in diverse ways. It can involve enhancing societal awareness about sustainability and the CE, cultivating community resilience, and fostering behavioral changes towards more sustainable practices. The interviewees involved in this study unanimously noted an upward trend in engagement within this field, be it at the organizational or individual level.

N2 remarked, "It is quite evident that there is a noticeable increase in the number of start-ups or new companies emerging in this industry" (N2, Interview, 26 April 2023). Complementing this perspective, N3 observed an upsurge in dress rental

services initiated at the individual level, further evidencing the broadening reach of CE activities: "It sparks ideas for people to start similar businesses, even using their personal collection" (N3, Interview, 12 May 2023). L1 concurred with these insights, acknowledging a considerable increase in this emergent trend. This escalating awareness and participation benefits not only the immediate communities where these start-ups operate but also exerts a broader ripple effect.

Furthermore, CE start-ups stimulate behavioral changes among both individuals and organizations. They challenge conventional consumption patterns by offering innovative products, services, and business models and foster a transition towards more sustainable practices. N1 and N3 reported that their customer base began adopting additional sustainable practices after engaging with their products or services. This notion is mirrored by L1, who also recognized the trend of CE businesses inspiring individuals to reassess their consumption habits and make more conscious decisions.

L1 highlighted this point, noting the potential for a bottom-up approach. They said, "With the growing interest in this matter; as a result, producers have no choice but to transform their practices from BAU to more sustainable ones" (L1, Interview, 4 May 2023). These behavioral changes contribute to waste reduction and diminished environmental degradation and promote a culture of sustainability and CE practices.

5.3. Challenges faced by start-ups in promoting CE

This section will focus on discussing the challenges that start-ups encounter when adopting CE practices in their business operations. By delving into these challenges, valuable insights can be gained regarding the barriers and limitations that may impede the widespread adoption and successful implementation of CE principles from the perspective of the entrepreneurial landscape.

5.3.1. Awareness and education

The start-ups encountered obstacles in promoting CE practices, revealing challenges linked to societal awareness and understanding of the CE concept. While the start-ups acknowledged a positive trend in awareness towards sustainability and the circular economy, they noted a general lack of comprehensive understanding beyond recycling practices. Start-up N2 emphasized the need for large-scale, systematic public awareness campaigns, considering this a significant challenge for CE businesses: "In order for CE businesses to survive, it is crucially important to have a massive and

systematic campaign to raise awareness among the public" (N2, Interview, 26 April 2023).

Similarly, at the landscape level, respondent L1 identified the need to extend awareness beyond mere waste management or recycling: "They do not fully comprehend that CE, at its core, is not just about waste or recycling alone. It encompasses more than that, including the concept of a circular economy" (L1, Interview, 4 May 2023). Adding to this narrative, the Indonesian government also acknowledged the information deficit concerning waste management in some sectors (Bappenas, 2021). Future plans are to enhance household awareness of waste management, change waste behaviors, and increase participation in sustainability practices (Bappenas, 2021).

Additionally, a perceived deficiency in the education system's coverage of sustainability and CE concepts emerges as a significant challenge. This deficiency, they suggested, contributed to practices such as waste mismanagement, impacting businesses like N2 and N4. Furthermore, it perpetuated a perception of sustainability as an impractical and costly choice, as explained by N4. This perception presents a significant barrier to start-ups seeking to penetrate a broader market and become mainstream options.

5.3.2. Governmental regulation and enforcement

The analysis of interview data highlighted the regulatory challenges encountered by start-ups in the circular economy. Start-up N1, focused on reducing plastic waste, underlined the absence of a plastic tax as a considerable challenge. The representative explained, "It is necessary for the government to come up with a plastic tax, as plastic is easily obtained at a relatively low price" (N1, Interview, 25 April 2023). A similar perspective on plastic regulation was shared by start-up N2, "Plastic is not suitable for a circular model. The government needs to come up with something to overcome this." (N2, Interview, 26 April 2023)—the lack of effective plastic regulation constrains these start-ups' attempts to promote the circular economy. The preference for cheaper, more readily available resources, such as plastic, remains a major stumbling block.

Fortunately, the government has demonstrated some initiatives to address this problem by targeting the elimination of single-use plastics and disposable items. The government has implemented a waste reduction roadmap, as outlined in Minister of Environment and Forestry Regulation P.75/2019, which includes a phased-out ban on single-use plastic by 31 December 2029 (Bappenas, 2022).

In addition, collaboration with government bodies presented significant challenges due to complicated regulations, lack of clarity, and inconsistency in understanding between

various levels of administration. This administrative maze resulted in high barriers to entry for start-ups (N1, Interview, 25 April 2023; N2, Interview, 26 April 2023).

The start-ups also highlighted another significant challenge of the government's inadequate enforcement of waste management policies. Start-up N4 emphasized the need for strong government enforcement targeting individuals and businesses to address issues arising from waste mismanagement effectively. The government has established regulations, such as The Ministry of Environment and Forestry no. P.75/MENLHK/SETJEN/KUM.1/10/2019 outlines a waste reduction roadmap by requiring producers to classify and sort their waste (Bappenas, 2022). However, the reality is that the majority of producers fail to comply with these regulations. Therefore, there is a critical need for robust enforcement measures to ensure compliance with these regulations.

These challenges are not entirely unexpected given the current phase of government action. As outlined in a publication from Bappenas (2021), the government is presently in the second phase of developing a national action plan for the circular economy. Moreover, based on the landscape's actor, interviewee L1 revealed that the government and associated organizations are working on a policy framework for the circular economy in Indonesia. The ultimate goal is to integrate a comprehensive guide to implementing the circular economy in Indonesia within the National Medium-Term Development Plan (RPJMN) 2025-2029.

5.3.3. Financial aspect

An overarching theme from the start-up interviews revolved around financial challenges, particularly evident in their scaling-up endeavors. Start-up N3 articulated their struggle with scaling up under prevailing conditions due to the need to expand their product range, which necessitates significant capital investment. Concurrently, Start-up N2 highlighted an inherent challenge within the circular economy (CE) sector - aligning idealistic CE practices with the pragmatic need for profitable business operations. The representative stated, "My friends in the same field also experienced the same thing. It is a challenge to keep your idealism and ensure your company is still in business for the years to come" (N2, Interview, 26 April 2023). This highlights the quintessential tension within the CE sector - pursuing sustainable practices while ensuring financial viability. It underscores the necessity for strong idealism and commitment to the CE philosophy for navigating this complex landscape.

L1 questioned the financial viability of CE start-ups, attributing their struggle partly to limited governmental funding. The observation that start-ups often rely on grants and investor capital raises questions about their financial models' sustainability and ability to generate a stable profit. While circular economy practices represent a promising pathway toward sustainability, their adoption and scaling need to be improved by the established norms of the prevailing economic model.

5.4. Start-ups' role in transitioning toward CE through the lens of MLP

This section aims to weave together findings on the role of start-ups in advancing CE using Geels' MLP framework. This approach allows for identifying the critical forces that facilitate or hinder the transition to CE, from the innovative niche practices of start-ups to the institutionalized regime level and the broader societal shifts at the landscape level. Moreover, this perspective offers valuable insights into the long-term trajectory of the CE transition and the critical role that start-ups can play in this process.

5.4.1. Niche, landscape, and regime level

At the niche level, the findings so far revealed five key factors that empower start-ups to foster CE development. These factors include market forces, partnerships and collaborations, social media use, continuous innovation, and technology advancement. These elements represent start-ups' innovative business practices, disrupting existing paradigms with fresh ideas. For instance, the presence of continuous innovation and advanced technologies emphasizes the ability of start-ups to introduce radical, novel solutions (Schot & Geels, 2008). Continuous innovation also helps to instigate and drive system transition toward more sustainable practices (Geels, 2010). At the same time, partnerships with multiple stakeholders and social media are essential tools that start-ups use to build supportive communities and networks, which can help them navigate challenging market conditions. Partnership with multiple stakeholders as key factors demonstrates the importance of networking and relationship-building in niche development within the MLP framework (Schot & Geels, 2008). Furthermore, the market forces, as one of the enablers, align with the MLP's niche level where innovative practices, such as CE start-ups, find traction due to changes in societal preferences (Geels, 2002).

At the landscape level, broader and external elements beyond the control of actors at the niche and regime levels were examined. The impacts of start-ups, involving environmental, economic, and social aspects, embody broader societal shifts potentially influenced by niche innovations (Geels, 2005). Start-ups' impacts could influence this level as they contribute to broader societal perceptions and priorities shifts. They are changing societal norms and potentially influencing the overall landscape. Over time, these impacts could alter societal norms or the overarching political-economic environment, thereby reshaping the landscape.

The regime level, representing the dominant economic system and its prevailing practices, is depicted by the challenges identified: awareness and education, governmental regulation and enforcement, and financial aspects. These echo the

findings of previous studies (Raven, 2007; Smith, 2007) that discuss the barriers within the current socio-economic system that could hinder the transition to CE practices. These challenges underscore the existing institutionalized barriers that start-ups face while striving to promote CE. For instance, governmental regulation and enforcement present structural constraints that start-ups must navigate. Simultaneously, the lack of awareness, education, and financial hurdles signify how elements of the incumbent regime might resist change or hinder the transition toward CE practices. For example, regarding awareness and education, one of the obstacles comes from a narrow public understanding of CE that may shape the regime's responses. In such a case, policies and company activities may result only in one aspect of CE, i.e., recycling, but not the whole aspects of CE. Government regulation and enforcement challenges find a place within the MLP framework as 'regime resistance,' where entrenched norms and regulations heedlessly stifle the growth of niche innovations (Geels, 2014). Furthermore, the financial hurdles start-ups face also belong to the existing economic regime, which prioritizes maintaining the status quo (Geels, 2014).

5.4.2. Relationship and interaction between levels

Understanding the interaction between these levels is crucial for recognizing the complexity of transition processes. The niche-regime dynamics involve a push-pull relationship, where niche innovations are simultaneously challenging and constrained by the regime (Geels, 2011). While niche innovations attempt to challenge and transform the dominant regime by introducing sustainable alternatives, they must also negotiate the constraints set by the regime. For example, start-ups' new practices and technologies often face regulatory barriers that favor traditional, linear economic practices.

The relationship between the regime and the landscape is also multifaceted. As landscape-level shifts occur, often influenced by the wide-ranging impacts of start-ups, they can influence regime stability and create windows of opportunity for niche innovations (Smith et al., 2010). For example, if the broader impacts of start-ups begin to swing public opinion towards more sustainable practices, this could lead to changes at the regime level, opening up the field for CE practices.

Transitioning from a linear to a circular economy necessitates considerable shifts across all three levels. This aligns with the concept of socio-technical transitions as described by Geels (2002), where niche innovations, regime adjustments, and landscape shifts collectively bring about systemic change. Nevertheless, it is essential to remember that such transitions are complex, often non-linear processes involving feedback loops and unexpected developments (Geels & Schot, 2007). They involve feedback mechanisms and unexpected developments, and the outcomes may not always align with initial expectations. The figure by Geels (2011) visualizes this

process as a shift from the currently dominant regime (linear economy) towards an emerging niche practice (circular economy) underpinned by changes in landscape developments.

These findings highlight start-ups' crucial role in fostering a transition towards a CE while highlighting the barriers that could slow this progress. Hence, it is clear that moving towards CE requires an orchestrated effort to nurture niche innovations, mitigate regime-level constraints, and capitalize on landscape-level shifts.

6. Conclusions

This study embarked on the journey to comprehend the role of start-ups in Indonesia, investigating their contribution to the development and implementation of CE practices to address the research question of this research. This study utilized the MLP framework to analyze the interplay between these start-ups, the socio-technical system they operate within, and the wider regulatory and market landscapes.

This study uncovered critical factors or "Start-up enablers" that have leveraged the development of Indonesian CE start-ups. These include market forces, partnerships with multiple stakeholders, social media use, continuous innovation, and technological advancement. In line with the MLP framework, these factors form the niche-level processes that influence the trajectory of these CE start-ups. As niche-level processes within the MLP framework, these factors are instrumental in creating a conducive environment for start-ups, influencing their growth, fostering innovation, and enabling the shift from linear practices to circular ones.

Furthermore, the study demonstrated that these start-ups also exert considerable influence across environmental, economic, and social dimensions. As such, they contribute to broader societal shifts that could reshape existing norms and the political-economic landscape. However, a persistent tension between the innovative niche activities and the dominant socio-technical regime is evident, highlighting these start-ups' significant challenges.

These challenges encompass a lack of awareness and education, stringent governmental regulations, and financial constraints, all of which spotlight the necessity for systemic changes to support the transition to a circular economy fully. Despite these challenges, start-ups in Indonesia continue to persist in their efforts, persistently nudging the prevailing regime towards more sustainable alternatives.

Using the MLP framework, this study has provided a rich analysis of how start-ups in Indonesia contribute to developing and implementing CE practices. It has shown how these start-ups, acting as niche innovators, interact with the socio-technical regime and influence the landscape level, fostering a transition from a linear economy to a circular economy towards a more sustainable future. Their contributions underscore the importance of providing an environment that nurtures innovation and facilitates the transition towards sustainable practices.

However, the pathway toward a CE necessitates an orchestrated interaction among all these levels. Despite facing significant challenges, startups play a crucial role in this transition, making them an essential focus for future research and policy interventions. The findings of this thesis thus call for further research, policy development, and practical initiatives aimed at

resolving the tension between the niche and the regime, thereby promoting the growth of the CE in Indonesia and beyond.

6.1. Future research

While this study has shed light on several important aspects of CE start-ups in Indonesia, there are still avenues for further exploration. One potential area for future research could be capturing CE start-ups in the food and beverages (F&B) sector, considering that F&B is currently a major contributor to waste generation in Indonesia (Bappenas, 2021). Additionally, investigating the role of policy and regulatory frameworks in facilitating or impeding the development and operations of CE start-ups would provide valuable insights. A comparative study comparing CE start-ups in Indonesia with those in other countries could also yield meaningful findings. Moreover, given the rapid advancements in technology and evolving market dynamics, ongoing research on emerging enablers and challenges faced by these start-ups is essential.

In conclusion, this study has made a significant contribution to the growing body of knowledge on CE start-ups in developing countries, particularly in the context of Indonesia. It has emphasized the potential of these start-ups as crucial actors in the transition towards a more sustainable and circular economy. The insights gained from this study hold relevance for policymakers, entrepreneurs, investors, and other stakeholders seeking to understand and support the CE movement.

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Appendix A

Table A.4. Interview questions and its relation to research questions

Level	RQ	Section	Guiding Questions	Purpose
Niche (Start-ups)	<i>What are the key factors enabling start-ups to contribute to the development and implementation of circular economy practices, and what are the associated impacts of their involvement?</i>	Motivation	What are the ideas behind your start-up? What motivated you to start your business in the context of the circular economy?	To understand the background and motivation behind the establishment of the start-ups
		Business practices	How would you define a circular economy and why is it important for your start-up?	To understand the start-ups' practices in CE context
			How does your start-up incorporate principles of sustainability and resource efficiency into its operations?	
			How would you describe what role your start-ups take in the development and implementation of CE practices in Indonesia?	
			What are the start-ups' key factors in successfully promoting CE?	
		Technology and innovation	How does your start-up innovate and leverage technology to support circular economy principles and reduce waste throughout the business process?	To analyze the importance of innovation in start-ups in promoting circular economy
			How do you see the role of technology evolving in the circular economy in Indonesia, and how is your start-up planning to stay at the forefront of this innovation?	
		Stakeholders' interaction	How do you collaborate with other stakeholders, such as suppliers and customers to promote the circular economy?	To identify the interaction between each levels involved in MLP from start-ups' perspective
			What does the interaction between the start-up and the government in Indonesia look like? Which government body do you get involved with the most?	
	Has the government supported your start-up in some ways? If yes, what was it and how did it work? If not, why?			
Impact	How do you measure the impact of your business on the environment and society?	To determine the impact of CE start-ups		
	How do you see your start-ups contributing to a shift or the transition in the CE practices?			
	<i>What are the challenges faced by start-ups in Indonesia in</i>	Difficulties	Do you encounter difficulties in scaling-up your business? What challenges have you faced in implementing circular economy principles in your start-up?	To analyze the obstacles experienced by the CE start-ups

Level	RQ	Section	Guiding Questions	Purpose
	<i>promoting and facilitating the adoption of circular economy practices?</i>		How did you address these challenges?	
			While growing your business, have you ever encountered issues with the compatibility between your values, goals, regulations and being profitable?	
		Expectation	How do you see the future of the circular economy in Indonesia and how do you plan to contribute to its development?	To find out the hopes and expectations of start-ups in regards of CE implementation in Indonesia
			What policies or regulations do you think are necessary to support the growth of circular economy businesses in Indonesia?	
Landscape (External organizations)	<i>What are the key factors enabling start-ups to contribute to the development and implementation of circular economy practices, and what are the associated impacts of their involvement?</i>	Current situation	How do you see the current state of support for circular economy start-ups in Indonesia?	To understand the current situation and role of external organization in the ecosystem
			What kind of role do you see external organizations playing in supporting the growth of the circular economy in Indonesia?	
		Stakeholders' interaction	How does your organization collaborate with the Indonesian government and private sector stakeholders, including start-ups, to promote the circular economy in the country?	To identify the interaction between each levels involved in MLP from landscape's perspective
			How do you see start-ups playing a role in the development of the circular economy in Indonesia, and what kind of support can your organization offer to help them grow and scale?	
			How does your organization collaborate with other international organizations or countries to share knowledge and promote circular economy globally?	
		Impact	How do you see external organizations contributing to the overall ecosystem of support for the circular economy?	To explore the external organizations' impact on CE in Indonesia
	What kind of impact do you see circular economy start-ups having on Indonesia's economy and society in the long-term, and how can your organization support this growth?			
	<i>What are the challenges faced by start-ups in Indonesia in promoting and facilitating the adoption of circular economy practices?</i>	Difficulties	What are some of the key challenges that your organization faces in promoting the circular economy in Indonesia, and how are you addressing these challenges?	To analyze the obstacles experienced by the landscape
			What kind of challenges have you faced in working with circular economy start-ups and/or the government in Indonesia?	
		Expectation	How do you see the regulatory environment in Indonesia impacting the growth of circular economy start-ups, and what kind of policies or regulations do you think are necessary to support their growth?	To explore the external organizations' expectations on the matter
	What do you see as the biggest opportunities for circular economy start-ups in Indonesia, and how			

Level	RQ	Section	Guiding Questions	Purpose
			can external organizations and the government work together to realize these opportunities?	
			What kind of partnerships or collaborations do you think are necessary between your organizations, the government and circular economy start-ups to promote the growth of the circular economy in Indonesia?	

Appendix B

Table B.1. Landscape-level respondent's detailed information

Code	Organization	Respondent's Position	Interview Date	Interview Length
L1	International organization based in Indonesia	Project Manager for Circular Economy	04/05/2023	48 mins

Table B.2. Niche-level respondents' detailed information

Code	Business Model	Established	Sector	Respondent's Position	Circularity based on 9R	Interview Date	Interview Length
N1	Offers household products refills directly to the consumers' door	2019	Wholesale & retail trade	Chairwoman, Advisor, and Co-Founder	R2 Reduce, R3 Reuse, R8 Recycle	25/04/2023	38 mins
N2	Produce construction materials made from plastic waste	2018	Construction	COO/ Co-Founder	R7 Repurpose, R8 Recycle	26/04/2023	53 mins
N3	A dress rental service for occasional events	2019	Textile	Co-Founder	R3 Reuse, R4 Repair, R5 Refurbish	12/05/2023	42 mins
N4	Waste management and recycling services	2018	Multisector	COO/ Co-Founder	R2 Reduce, R3 Reuse, R8 Recycle	18/05/2023	40 mins