UNIVERSIDADE CATÓLICA PORTUGUESA

Financing Circular Economy Projects

Evidence from Clinical Case Studies

Cláudio Miguel Teixeira Castendo

Católica Porto Business School

April, 2022

UNIVERSIDADE CATÓLICA PORTUGUESA

Financing Circular Economy Projects

Evidence from Clinical Case Studies

Final Work in Academic or Organisational Context

presented to Universidade Católica Portuguesa

in order to obtain the master's degree in Finance

by

Cláudio Miguel Teixeira Castendo

Under the guidance of

João Filipe Monteiro Pinto

Católica Porto Business School, Universidade Católica Portuguesa

April, 2022

"Winning Is Not Everything, But the Effort To Win Is"

- Zig Ziglar

Dedication and Acknowledgements

This master's dissertation would not have been possible without the guidance of Professor João Pinto. Thank you for agreeing to guide my dissertation, always being attentive, giving the best advice and suggestions that allowed me to develop and maintain my motivation throughout these months.

To my parents, Cláudio and Carla, for their education, love, presence, unconditional support, advice, and for making my development as a person, academic and professional, possible.

To my brother and best friend Nuno, thank you for your support, companionship and for being one of my motivators and for making me proud to contribute to your development

To my grandfather Castendo for his advice, presence, support, example and for always believing in me.

To my Dear Márcia, thank you for all the dedication, companionship, understanding, patience, and for the motivation you give me as a result of the example you represent to me. Thank you for the love. Without you, my achievements would have no meaning.

I want to thank all my friends and family members who have contributed in a crucial, constructive and positive way during my life.

Finally, I want to thank God for being present.

Abstract

Financial Industry has a very signficant role to play in promoting sustainability and is showing significant leadership in supporting the mainstreaming ESG in investments and in making the most out of these opportunities. There are large business opportunities in circular economy (CE), and funding these activities is very attractive to the financial sector.

The existing financial instruments offered by public and commercial actors open up a world of possibilities for entrepreneurs who want to invest in setting-up or altering their firm according to circular principles. To obtain funds, project promoters and companies face additional challenges due to the business and financial complexities inherent in many circular economy projects. This study emerges to fulfill gaps regarding the main motivations that lead to the development of projects in circular economy, as well as the financial instruments and funds used to enable the implementation of such projects. To achieve these goals, this study intends to characterize, describe and interpret the underlying motivations of Circular Economy. Therefore, this study is developed according to a Clinical Study focused on 3 Circular Economy projects.

Expectedly, empirical evidence shows that, in fact, financing Circular Economy projects generates motivating factors for companies and institutions. Namely, 3Rs, Reduction of Costs and Pollution, on the Improvement in Competitiveness, Innovation, Processes, ESG Ratings and, ultimately, the Reputation of Institutions. All these motivations are positively correlated and address resource scarcity, impact on environment, economic concerns, governments, companies, and societies worldwide.

Keywords: Algae; Bromelain; Circular Economy; ESG; Keratin.

Total Words: 9878

Resumo

O setor financeiro tem um papel crucial a desempenhar na promoção da sustentabilidade e está a demontrar uma liderança significativa no apoio à integração ESG nos investimentos e no aproveitamento destas oportunidades. Existem grandes oportunidades de negócios na economia circular e o financiamento destas atividades é muito atraente para o setor financeiro.

Os instrumentos financeiros existentes oferecidos por atores públicos e comerciais, abrem um conjunto de possibilidades para empreendedores que desejem investir na criação ou alteração da sua empresa de acordo com princípios circulares. Para obter fundos, promotores de projetos e empresas enfrentam desafios adicionais devido às complexidades empresariais e financeiras inerentes a muitos projetos de Economia Circular. Este estudo surge para preencher lacunas quanto às principais motivações que conduzem ao desenvolvimento de projetos em economia circular, bem como, dos instrumentos financeiros e fundos utilizados para viabilizar a implementação destes projetos. Para atingir estes objetivos, este estudo pretende caracterizar, descrever e interpretar as motivações subjacentes à Economia Circular. Assim, este estudo é desenvolvido com base num Estudo Clínico focado em 3 projetos de Economia Circular.

Espera-se que as evidências empíricas demonstrem que o financiamento de projetos de Economia Circular gera fatores motivadores para empresas e instituições. Nomeadamente, os 3Rs, Redução de Custos e Poluição, a Melhoria da Competitividade, Inovação, Processos, Ratings *ESG e, em última análise, a Reputação das Instituições. Todas estas motivações estão positivamente correlacionadas e abordam a escassez de recursos, impacto no meio-ambiente, preocupações económicas, governos, empresas e sociedades em todo o mundo.*

Palavras-Chave: *Algas; Bromelaina; Economia Circular; ESG; Keratina*

Table of Contents

List of Figures

List of Tables

List of Abbreviations

BR – Bromelain

CBQF - Center of Biotechnology and Fine Chemistry of the Portuguese Catholic University

CE – Circular Economy

CEP – Circular Economy Projects

CENTI - Centre for Nanotechnology and Smart Materials

CITEVE - Technological Center for the Textile and Clothing Industries of Portugal

CRM – Critical Raw Materials

EMF – Ellen MacArthur Foundation

EPO – European Patent Office

ESG – Environmental, Social and Governance

ING – International Netherlands Group

SME – Small and Medium-Sized Enterprise

1. INTRODUCTION

"As the Circular approach to sustainability begins to gather ground, we humans are finding ourselves within the circle, not without" (Schwarz, 2016).

In today's world, temperatures are rising, water shortages are becoming more frequent, food supplies are becoming increasingly scarce, and the gap between rich and poor is widening (WBCSD Education, 2016). As a result of rising populations, the expansion of middle classes in emerging nations, technological advancements, demand for products and services continues to expand continuously. Businesses will face major problems due to commodity price fluctuations and market instability as raw materials become more difficult or expensive to obtain.

While the linear economy was immensely effective in generating material wealth in industrialized nations up until the 20^{th}, it has shown flaws in the new millennium, and a near-term collapse is predicted (Sariatli, 2017).

Figure 1 illustrates resource movement in Linear Economies. The linear economy terminates with waste at the end of the production flow.

Figure 1. Resource flow in Linear Economy

Source 1. *Export Leadership Forum (2015)*

The current economic model, according to the Ellen MacArthur Foundation (2013), has its roots in the historically unequal distribution of income by geographic region. The industrial nations have had an excess of material resources and energy mostly because resource consumers have been concentrated in the most developed regions, and material inputs have been sourced progressively from the global arena. The materials were inexpensive in this arrangement when compared to the expense of human labor. As a result, producers have been encouraged to establish business models that make great use of resources while minimizing human labor (EMF, 2013). In addition, more energy and materials they could use to enhance human capital, the greater the competitive advantage they could achieve. The inevitable result of low-cost materials and high-cost labor is a widespread disregard for recycling, reusing, and placing a high value on waste. According to the EMF (2013), regulatory, accounting, and fiscal rules have been supportive of this system, as they haven´t issued a protocol to charge producers for externalities, therefore producers are less likely to examine the external costs of their operations.

Governments, investors, businesses, and civil society are increasingly interested in sustainability and circular economy. To the benefit of present and future generations, sustainability envisions a balanced integration of economic performance, social inclusion, and environmental resilience (Geissdoerfer et al., 2017). To respond to the imminent risks and possibilities provided by these challenges, businesses must adapt and innovate. This will most likely require developing new products and services to suit the expanding needs of a growing population in a world of scarcity, as well as shifting away from the existing linear "take-make-dispose" economy approach and toward a circular economy model (WBCSD Education, 2016). CE evolved as an umbrella concept in the 2010s (Blomsma and Brennan, 2017), and anticipates a more resource-effective and efficient economic system by restricting, slowing, closing materials and energy

flows (Bocken et al., 2016; EMF, 2015). A CE approach has the potential to generate enormous economic, social, and environmental benefits (EMF, 2015a). The more an industrial foundation reuses and cycles its waste, the closer it gets to the CE model and becomes more profitable (Lancaster, 2002), and becomes more environmentally friendly.

Figure 2 exhibit the resource movement in Circular Economies. Circular economies use waste as materials for manufacturing, resulting in a circular flow of resources.

Figure 2. Resource flow in Circular Economy

Source 2. *Bortolotti, L. (2015)*

According to ING Bank (2015) companies are looking for opportunities within the CE or partnering with firms that have moved towards the CE to profit financially, due to the distinct nature of CE business models compared to traditional business models and their attendant effects on other sectors of the economy.

Financing is tough to obtain in CE projects. On one hand, new technology and business models are frequently untested and sophisticated, rely on unstable

supply chains, and operate in volatile markets (Goovaerts, et al., 2018). Furthermore, CE projects frequently involve small sub-investment grade promoters who have little collateral or physical assets. CE promoters frequently experience limited access to funding or higher costs of capital due to the increased market and credit risks involved (Goovaerts, et al., 2018). While market forces (commodity price changes) alone could produce a CE, there is a danger of a sluggish transition and significant opportunity costs, according to research issued in 2015 by the EIB's Innovation Finance Advisory section on access-to-finance conditions for CE initiatives. As a result, policy intervention and support in the form of innovative funding and financing instruments have space. Under this framework, this study emerges, and will be focused on 3 Clinical Case Studies as its core, with the purpose of identifying the instruments and methods for financing CE Projects, and ultimately, the motivations and the advantages that lead to the development of these projects. Under this framework, and based on the exposed literature and previous empirical evidence, the following research questions were raised:

Question 1: What are the main motivations that lead to the development of projects in circular economy?

Question 2: What are the financing instruments used to enable the implementation of such projects, from start-up to market launch?

In question 1., the motivations that lead to the development of CE projects are, namely, 3Rs, Reduction of Costs and Pollution, on the Improvement in Competitiveness, Innovation, Processes, ESG Ratings and, ultimately, the Reputation of Institutions.

In question 2., the funds to finance the Bromelain project, were obtained from a PhD Scholarship, financed by FCT. Thus, both the Keratin from pig´s hair and Peptides from Algae and Microalgae were obtained from COMPETE 2020 and

supported by remarkable institutions. In addition, a variety of more complex financial instruments, as suggested in Table 2, should be considered.

It is important to emphasize that, all the main motivations, are positively correlated and address resource scarcity, impact on environment, economic concerns, governments, companies, and societies worldwide. Thus, the empirical evidence and the analysis and potential of each of the 3 projects, allows to assess that CE, the instruments and motivations underlying its financing are crucial for the success of institutions and society as a whole. In the long-term, there will be less and less obstacles and, consequently, the financing of CE projects is vital for Institutions and it allows them to gain even more notoriety, in comparison with their competitors.

This study is structured in 6 chapters. In chapter 1, a brief introduction and contextualization of the study is carried out. Then, in chapter 2, the Literature Review is presented. Chapter 3 presents the Problem, Research Questions, Methodology and the importance of Clinical Studies. Chapter 4 provides the Data regarding the Clinical Studies, more specifically, its description, financing instruments, the development, potential, patents, implementation and the motivations regarding these 3 CE Projects. In chapter 5, the conclusions drawn from the study are highlighted. In addition, the main conclusions and limitations are also presented. Chapter 6 provides opportunities for further research.

2. LITERATURE REVIEW

This chapter reviews extant theoretical and empirical literature on sustainable finance, CE and financing instruments.

2.1. Circular Economy

Natural resources on planet earth are limited. The rate at which we use these has long been noted as unsustainable (Malthus, 1798; Green, 1894; Meadows et al., 1972; Behrens et al., 2007). To achieve sustainability, society needs to dramatically reduce its use of natural resources. At the same time, a growing world population and escalating affluence require an increase in the production of goods and services (Commoner, 1972; Myers and Kent, 2003; Cumming and Cramon-Taubadel, 2018). This in turn stipulates a greater use of natural resources.

As society moves towards strategies of sustainable development, debates have emerged on how resources can be used more efficiently (Daly, 1990). One proposition has been the concept of a CE (Pearce and Turner, 1990). Based on the work of Leontief (1991) the underpinning idea is to repeatedly use the same resources in a loop, decoupling precious stocks of virgin resources from economic activity. In this approach to sustainability, what becomes key is that more sustainable living at the societal level can only occur when organizations use resources more efficiently (Figge et al., 2018). According to the United Nations Environment Programme (2012), in CE nutrients and material resources circulate and remain within biospheres and product systems. In addition, a wide variety of metrics has emerged and aims to capture the extent of firms' contributions to a CE. Common to most indicators is the assumption that the

efficiency of a resource can be measured by the number of times it is used, i.e., its circularity (Figge et al., 2018). Contrarily, Franklin-Johnson et al. (2016) propose a different approach and emphasize the length of time a resource is in use, i.e., its longevity.

Based on empirical evidence, EMF (2013), Murray et al. (2015), and Wijkman and Skanberg (2015) point out that CE fits into three spheres of sustainable development, as it is a system that replenishes resources needed for manufacturing, while promising opportunities for economic development. In turn, it will improve the quality of life. According to Murray et al. (2015) the main features that make the CE stand out in the achievement of sustainability goals are the closed material loops and the designing of products with the possibility of reusing them.

In 1987, the Brundtland Commission[1] called for the creation of new ways to assess progress toward sustainable development, resulting in the emergence of a wide variety of sustainable development indicators advanced by academics, companies, environmental agencies, and governmental organizations (Hardi & Zdan, 1997; Michalos, 2014). Currently, the implementation of CE practices appears as a timely, relevant and practical option to meet the goals of Sustainable Development. In fact, as Hicks et al. (2005) and Schroeder et al. (2019) show that the implementation of CE approaches can be applied as a "toolbox" for achieving Sustainable Development targets. Accordingly, the CE paradigm is extensively explored by institutions as a possible path to increase the sustainability of our economic system (Elia et al., 2017).

Su et al. (2013) argue that CE is based on 3R principles, namely reducing, reusing and recycling. Reducing refers to decreasing consumption of resources and generation of pollutants (Su et al., 2013). Reusing means utilizing resources

[1] Also known as the World Commission on Environment and Development (WCED), operated from 1984 to 1987. It is also known as the UN Special Commission on the Environment at the United Nations. The purpose of this Commission was to help nations achieving the goal of sustainable development (Kono, 2014).

as many times as possible or in diverse ways (Brunori et al., 2005), and Recycling is the process of turning end-of-life products into renewable energy or resources, allowing them to enter a new product life cycle (Hicks et al., 2005). There is a general agreement that the objective of CE is to reduce harm to the environment and to close the loop of the product lifecycle (EMF, 2013; EU Commission, 2014; Prieto-Sandoval et al., 2018). In addition, Scheel (2016) argues that, CE will also deliver valuable products to others from redesigned waste, and that aims to create a new relationship with goods and materials, a relationship that saves resources, energy and creates local jobs (Stahel, 2016).

2.2. Transitioning from a Linear to Circular Economy

The anticipated shortages of virgin materials are one of the economies' major challenges. Environmental economists Pearce and Turner first proposed the concept of a CE in 1989. They argued that a traditional open-ended economy was created without a built-in desire to recycle, as seen by the environment being treated as a waste reservoir. Despite this, the EMF (2012) brought CE to the attention of the general public. While this was primarily a scientific argument for decades, she elevated the issue to the level of politicians and business leaders by making it a vital economic concern and tying it to company executives.

The transition to a CE requires a significant shift in how we generate and consume goods (European Comission, 2019). As pointed out by Planing (2015), transitioning from a linear economy to a CE requires four constituents, namely: materials and product design, business models, global reverse networks and enabling conditions. Primary players and fields in a circular transition are: business models and their roles, the economic system and policymakers'/regulators' roles, and the financing strategy and financiers' roles (European Comission, 2019). This transition is inevitable, as the world population increases and natural resources are limited. This will imply business

chances, which will create new employment opportunities. However, considerable barriers exist to a widespread adoption of more circular practices, including economic incentives, accounting rules, and regulation that often favor conventional linear solutions and business models (EU Comission and Ministry of Environment of Japan, 2019). According to Rhode (2017), transitioning towards a greener and more resilient economy requires massive public and private investments. Bearing this, Governments have a crucial role. Finance has to facilitate the shift to a CE, more specifically, by providing resources for circular investments, insurance products suitable for circular practices, such as leasing and sharing, and developing rating systems and information disclosure requirements that help improve transparency around sustainability-related business risks (EU Commission and Ministry of Environment of Japan, 2019).

Finance has done significant work on how to assess and communicate risks related to climate change. Consequently, the industry has developed knowledge and scenario analysis tools, gained experience in working with natural science data, and this will facilitate on how to address sustainability issues in a holistic manner. There are strong linkages between climate change mitigation and CE, which can help to stimulate investments in circularity (EU Comission and Ministry of Environment of Japan, 2019).

As pointed out by the EU Commission and the Ministry of Environment of Japan (2019) the transition to a CE requires the contribution of all groups in society. Business innovation, regulatory reforms, and lifestyle changes need to go hand-in-hand.

In the future, sustainable investments must evolve from a niche to a mass market that integrates sustainability into business models and culture, with an eye towards 2030 and beyond (United Nations Conference on Trade and Development, 2021). To do so, the market must address greenwashing, SDG washing concerns and its geographic imbalance. The transition must be speed up

with effective coordination and monitoring of their activities (United Nations Conference on Trade and Development, 2021).

2.3. Why Financing Circularity

Companies and financial institutions actively search for their role in the CE due to the reason that it's a growing market, and if the CE is stimulated by technological innovation, it could increase the resource productivity (Manyika, et al., 2013; EMF, 2012). Additionally, it fits into the sustainability targets of many banks, as they are recognising the opportunities that clients who are leading in sustainability are more innovative, have better financial performance and credit rating (ING, 2015). Moreover, investors are more aware of linear risks and circular opportunities, as the current linear model exposes companies and prevents investors from achieving sustainable value creation. These companies are under pressure from global trends such as resource scarcity, environmental uncertainty, tightening regulations, and disruptive new businesses and technologies. As a result, investments in these companies are very exposed to linear risks (Circle Economy, 2017).

As Ueda (2019) mentions, there are large business opportunities in CE, and funding those activities should be attractive to the financial sector. On one hand, finance industry, as Schomaker (2019) refers, has a crucial role to play in promoting sustainability and is already showing significant leadership. On the other hand, and according to the European Comission (2019), investors don´t consider CE projects as a trivial matter, and both companies and the financial sector see each other as responsible for failing to fulfill their responsibilities. Thus, the business sector points that the financial sector is incapable of evaluating the benefits of circular methods and exaggerates the risks associated with circular business models. In addition, prices and accounting rules that create adverse incentives need to be addressed, tools and procedures that help investors and

lenders evaluate risks associated with linear and circular business practices are required and should be improved (Schomaker, 2019).

2.4. Financing Instruments of Circular Economy Projects

A successful transition to a CE requires specialized policies and investment (Wijkman and Skånberg, 2015). Till recently, contributions of banking and other financial institutions towards the push for sustainability have never been valued (Alfredsson and Wijkman, 2014) in comparison to supply chain management concerns in sustainable manufacturing.

The European Comission (2019) indicate that a significant increase in demand for funding to support CE businesses and products will be required to make a transition to a CE. The volume of "circular finance" is insufficient to sustain a shift in how material value is captured and preserved. While CE technology and business models exist, they have yet to gain the market traction required to make an influence on value chain processes. Companies with CE business models and products need to be able to obtain funds to scale up their operations in order to shift value chains. Since the transition to a CE must be a systematic shift, access to funding must be provided across all industries (European Comission, 2019).

According to Rizos et al. (2015), small and medium-sized enterprises (SMEs), face difficulties in obtaining financing as financial institutions frequently assign them high risk ratings. In addition, even if SMEs are successful in convincing a bank to lend them money, acquiring the collateral/guarantees that bank requires is another challenge.

The significantly greater initial cost of a Business Model Innovation or an alternative energy supply based on renewable sources may require financial assistance to CE companies (Rizos et al., 2015). If the company is an SME with insufficient funds to fund the project, it may need outside assistance, and the decision to finance or not depends on the project's expected profitability

(Acheampong, 2016). Companies can obtain funds from both external[2] and internal[3] sources of financing (Brealey et al., 2001; Zimmerer, et al., 2002; Mikócziová, 2010).

Zimmerer et al., (2002) indicate that understanding and selecting the right form of finance for a company is crucial to its success. Different sources of financing aren´t perfect substitutes. Internal sources are preferable to external sources (Mikócziová, 2010),mainly because one party possesses information that the other doesn´t, which is referred as "information asymmetry" between business managers and potential investors. In new enterprises and developing businesses, the issue of information asymmetry is particularly acute (Mikócziová, 2010). As mentioned by the European Investment Bank Report (2015), the existing financial instruments offered by public and commercial actors can already open up a world of possibilities for entrepreneurs who want to invest in setting-up or altering their firm according to circular principles.

Table 1 provides an overview of the financial instruments that can be used to fund circular business models (ING, 2015). The first column lists the various financial players, while the second and third describe the products they provide and how they might be utilized to finance circular projects. To obtain the optimal balance of finance for a specific project, a combination of instruments is frequently required. Despite all these financing possibilities, one of the major barriers to the adoption of circular projects is the lack of finance on acceptable terms (Goovaerts and Verbeek, 2018). These types of companies or projects are more complex, resulting in higher risks than typical investment deals. To some extent, innovative circular businesses are financed by equity financing, impact investors, and EU funds (Goovaerts and Verbeek, 2018).

[2] A term that defines money that a firm can raise from sources other than its own activities. It can refer to equity offerings, in which a company raises capital through outside investment and of an initial public offering (IPO) (Capital.com, 2022).

[3] Refers to a company that uses its own profits as a source of capital for a new project, instead of borrowing money from other sources (Capital.com, 2022).

Table 1. Supply and demand for financing circular business models

Bank Finance	Corporate Debt	Traditional corporate financing with corporate guarantees to finance circular companies.
	Lease	Can be used in pay-per-use business strategies. Creditworthy clientele and products with predictable residual values in secondhand marketplaces are eligible.
	Factoring and Supply Chain Finance	Can overcome the pre-financing problem associated with pay-per-use revenue models by selling uncertain future cash flows to a financial institution.
	Structured Finance	Large stand-alone circular projects may be eligible for funding.
	Balance sheet reduction through off balance finance	The issue of balance sheet extension can be addressed.
Capital Markets	Equity Finance: IPO	Valuable sources of financing for predominantly larger and more established circular companies that fulfill the capital market's requirements and specifications.
	Debt Finance: Green Bonds	
Impact Investors		Most circular firms are still in the early stages of development, are not profitable, or lack a track record. Because they have a longer-term vision, more 'patient' investors, and a risk/return that is less linked, non-commercial finance can bridge the gap from pilot to growth stage.
Venture Capital, Private Equity, Family Offices		Many start-up companies in the circular economy rely on this form of funding. Their requirement for rapid growth and payback periods, on the other hand, may limit their suitability for circular businesses.
Near Banks like Google, Apple, Amazon, etc.		Provide additional payment options and perhaps working capital solutions.
Crowd Funding	Peer2Peer Lending	Source of funding for circular companies that involve the (local) community or are founded on crowd-pleasing ideas.
	Equity Investment	

Source 3: *Adapted from ING (2015)*

3. The Problem, Research Questions and Methodology of the Clinical Study[4]

3.1. The Problem

This dissertation aims to contribute to Financing CE Projects field of research, essentially by trying to fulfill some gaps regarding the methods and instruments used to finance CE Projects. This contribution will be based on a clinical study methodology, which will be focused in 3 Clinical Case Studies.

As seen in the Literature Review, there are a variety of reasons that, individually or collectively, motivate firms and institutions to finance and generate CE Projects. After analyzing each of the Case Studies, in terms of their characteristics, objectives, potential impact, in sustainable and economic-financial terms, it will be possible examine the factors that lead to the development of circular economy projects and determine which financing tools will be employed to achieve this goal. This, consequently, will accelerate the transition to a CE.

3.2. Research Questions

In the problem analysis, motivations were presented that can be justified as underlying the gaps on the methods and instruments used to finance CE Projects based on available research. Following the review of the exposed literature and previous empirical evidence, the following research questions were raised:

1: What are the main motivations that lead to the development of projects in CE?

[4] Defined by Jensen et al. (1989), who coined the term "clinical studies" from the medical literature.

2: What are the financing instruments used to enable the implementation of such projects, from start-up to market launch?

Ultimately, this research will contribute to the discussion on the motivations, methods and instruments used to finance CE projects.

3.3. Methodology

The Methodology analysis differs according to the research objectives, and it can take either a qualitative or a quantitative approach. In this work, a qualitative approach is used, as the main method to study how finance supports CE Projects. In addition, a qualitative case study approach is a research methodology focused on the exploration of a phenomenon within some particular context through various data sources, and it undertakes the exploration through a variety of lenses in order to reveal multiple facets of that phenomenon (Baxter and Jack, 2008). Therefore, the lack of Research regarding the ways that CE Projects are financed and the challenges they face are crucial to study. To assess the impact that finance has on CE Projects, in this work an exploratory examination and inductive approach are used, aiming to identify the motivations for the implementation of three relevant projects – the case studies – in CE, and how these projects are (or will be) financed. The three case studies are in different phases, differing in dimension, I&D, patents, financial instruments, and financing phases. In short, in this work a methodology based on a clinical study is implemented.

3.4. The Importance of Clinical Studies

In corporate finance, clinical Studies were discussed initially by Jensen, et al. (1989) in the Editorial of the Journal of Financial Economics[5], as well as their role in the development of Financial Economics. The first set of papers in the new Clinical Papers section appears in this issue of the Journal of Financial Economics. This section's goal is to give a high-quality professional forum for Academic Research into particular cases, events, practices, and specific applications. Clinical studies stand as an essential method of study as they provide insights into the world, challenge accepted theories, and use distinctive sources of data. These papers, like some of the medical literature from which the term "clinical" is derived, will frequently deal with single cases or small numbers of cases of particular interest. Jensen et al. (1989) expect new high-quality empirical and theoretical research to emerge as a result of these clinical studies. This result can help theorists and empiricists arrive at empirically relevant imperfect market theories[6]by providing in-depth examination of a phenomenon's key aspects. When effective, such studies have an impact on not only the topics that large-sample empiricists are interested in and the data they gather, but also the hypotheticals and basic characterizations that theorists employ in modeling the world. Financial institutions' roles and operations are changing dramatically, as new products and practices emerge on a regular basis. Because the changes give tests of current ideas and imply new problems of theoretical interest, new strategies to communicate these fascinating changes to the scientific community are necessary. Clinical papers, which are mostly based on real-life occurrences,

[5] Is a notable peer-reviewed academic journal in financial economics that covers theoretical and empirical subjects. It is a specialized forum for the publication of research in financial economics and firm theory, with a focus on high-quality empirical, theoretical, and experimental contributions in the following major areas: capital markets, financial intermediation, entrepreneurial finance, corporate finance, corporate governance, the economics of organizations, macro finance, behavioral finance, and household finance (Journal of Financial Economics, 2022).

[6] Refers to any economic market that does not meet the rigorous standards of the hypothetical perfectly—or purely—competitive market (Kenton, 2020).

can aid in the discovery and communication process, as well as in the advancement of financial science.

Several groups of researchers will concentrate on theory, empirical tests, and clinical studies due to the overall benefits of specialization. These three groups are mutually beneficial. Theory provides logical discipline and precise hypotheses for both empirical and clinical study. Empirical tests steer theorists in the right path by highlighting models that aren't relevant and showing areas where clinical research could identify specific examples. Clinical Studies, as a result, assist in the planning of both theoretical and empirical research (Jensen, et al., 1989).

For Clinical Financial Studies, there is currently no standard or acknowledged model. Clinical studies, just like empirical or theoretical publications in the research literature, rarely provide complete answers to the questions they address. Editors and referees must avoid attributing to a single paper the same criteria that apply to the entire scientific process; the quality of a single paper - clinical, theoretical, or empirical - should not be based on whether it conclusively posits and answers a major topic. Clinical Studies will be judged on whether they create new issues or puzzles for the profession rather than whether they supply new answers (Jensen, et al., 1989).

Clinical papers will vary in format, scope, and substance, and they will often be more speculative. These papers will almost definitely focus on descriptive and normative subjects rather than quantitative ones. Successful clinical studies maintain the world's substance while being minimalistic in their explanations and hypotheses (Jensen, et al., 1989).

The announcement of the "Corporate Governance Clinical Paper Competition", developed by ECGI[7] (European Corporate Governance Institute)

[7] Is an international scientific non-profit organization that promotes best practice by providing a forum for debate and dialogue between academics, legislators, and practitioners on critical corporate governance issues (ECGI, 2022).

in collaboration with the Journal of Financial Economics, the Swedish Center for Business and Policy Studies (SNS)[8], and the Jan Wallander and Tom Hedelius Research Foundation[9], is another fact that marks the intention to develop this type of research methodology. Its main goal was to promote the development of clinical studies on cases (of corporate governance in Europe) that would allow researchers to better understand the complexities of companies and their behavior, something that is often impossible to achieve using "traditional" methods (formal models and econometric analyses/statistics).

Clinical studies such as those by McConnell and Schwartz (1992), Esty (1999), Rommens et al. (2003) and Mills (2005) examine concrete examples in relation to a specific theoretical question. Despite this, certain Clinical Studies, look at a group of cases and use analyses that are more similar to those used in empirical studies. Bortolotti et al. (2001), Buysschaert et al. (2004) and Dissanaike and Papazian (2005) are some examples of this type of research methodology.

The present dissertation fits within the framework of these previous researches, and the method used is based on a Multiple Clinical Case Studies research methodology, which is is becoming more popular among qualitative researchers whereas it allows for methodological flexibility by including multiple paradigmatic perspectives, study designs, and methodologies.

[8] Is a non-profit organization that brings together the worlds of academics, business, and government to share knowledge and discuss important societal concerns. With 280 corporate and institutional members, SNS is a membership-based organization (Swedish Center for Business and Policy Studies, 2022).
[9] Were designed to aid social scientific research, particularly in the fields of economic history, economic geography, business economics, economics, and econometrics (University Of Boras, 2022).

4. Financing Circular Economy Projects – Case Studies

4.1. Analysis and description

4.1.1. Extraction of Bromelain from Pineapple

This first Project consists of a method for extracting an enzyme denominated Bromelain (BR) from ananas waste for use in products for people and animals. This enzyme can be found in vegetable tissues such as peel, stem, fruit and leaves of the Bromeliaceous family, including pineapple stem. In addition, this enzyme is used in a variety of industries, including food and pharmaceuticals. In the food industry, BR is utilized as a meat tenderizing enzyme, but it's also employed in brewing and as a functional protein in pre-digestion and digestive aids. It is important to emphasize that only natural substances are used in the technology (biological precipitants).

BR has recently been linked to a variety of therapeutic effects, including the reversible reduction of platelet aggregation, alleviation from bronchitis, improved recovery after surgical traumas, and improved drug absorption, notably antibiotics. Enzymatic debridement of necrotic tissues from ulcers and burn wounds, as well as medical therapy of cancer patients, are two of the most important medicinal applications of BR. Controversially, any secondary effects associated with its use are nullified, and if compared to conventional procedures, it enables the production of high-purity products in a single step at a substantially lower cost. When generating new or different products, such as in the food business, pharmaceutics, emulsions, or gel formulations, this process is also unique in that, and it eliminates interferents. Currently, a granted patent in Europe protects this technology.

4.1.2. Extraction of Keratin from Pig´s Hair

This Project consists of a more simplistic method of extracting Keratin from Pig's Hair by utilizing a commercial detergent for digestion followed by ultrafiltration, making this a simple, low-cost, and ecologically friendly process.

Pig farming is a huge global industry that produces several by-products that pollute the environment. Pig hair is an example of a by-product from slaughterhouses. Pig dehairing uses a lot of water and produces wastewaters with a lot of organic matter, fat, and dirt. As a result, hair is a waste product that should be managed to maximize its re-use and value. Hair is now utilized in a variety of products, including brushes, felt, rugs, upholstery, plaster binding, insulation, and glue. Keratin, which is found in wool, feathers, and other keratinous substances and makes up around 80% of hair, is one of the most important components. The extraction of keratin from human hair has been described in several research. However, there is little study on extracting keratin from pig hair. Nonetheless, existing approaches are related with several issues, including pollution, high costs, and time consumption. Finally, it is important to emphasize that this method is protected by a patent application in Europe.

4.1.3. Extraction of Peptides from Algae and Microalgae

For this Case Study, its Project consists of a better method to extract a greater amount of protein content and high nutrient digestibility to be used as a food ingredient and/or feed farmed fish and shellfish species, in comparison with the existing approaches. This leads to the creation of higher-value seafood products as well as more sustainable and efficient food chains.

Microalgae, often known as seaweed, are unicellular organisms that exist individually, in chains, or in groups. They can be produced without wasting vital resources like freshwater or arable land, and all they require is sunlight for

energy. Working with microalgae also has the advantage of rapid growth, since they can double in size in, approximately, less than a day.

Microalgae contain proteins that have promising properties in a variety of fields, including cosmetics, food supplements, and health, and can be found in commercial products. Microalgae proteins boost dietary benefits and can also be used as a food preservative in food supplements. Finally, significant research has been made so far, particularly in cosmetics and food goods, but bioactive peptides found in these algae can still introduce additional benefits. As so, recent research is focusing on the antioxidant, anti-inflammatory, anti-hypertensive, and anti-diabetic properties of bioactive microalgae to discover and create even more benefits.

4.2. Financing Instruments

According to the European Comission (2019), the existing financial instruments from public and private lenders open a world of possibilities for entrepreneurs who want to start a circular firm. While large businesses can generally fund the circular shift internally through retained earnings, young and fast-growing businesses are sometimes dependent on external capital to grow. Today's taxation is mostly based on labor income. Most developed economies currently penalize labor as a "renewable factor input" above material and non-renewable inputs, according to resource and labor market economists. They advocate for a paradigm shift (EMF, 2012). Shifting the tax burden away from labor and income and onto nonrenewable resources.

According to the EMF (2012), individual companies and groups of companies will require not only assistance with ownership transitions, but also funds for research and development and new technologies. Financial sector plays an essential role in the CE, both in transition and in steady state. Banks are often

significantly more experienced and thus better at creating long-term return models than corporations alone, due to the volume of cases they handle.

Circular businesses or projects are more complex, resulting in more risks than traditional investment deals. Thus, as Uzsoki (2020) mentions, to solve the world's multiple sustainability concerns, new financial instruments are required. On the one hand, they are critical for investments that would otherwise have a poor risk-reward profile but are expected to have a significant ESG impact. On the other hand, as sustainable investing becomes more popular, it's essential that participants in the financial markets have a variety of financing options. Under this framework, the following 3 chapters provide all the data of the circular projects financing instruments, funds and its institutions.

4.2.1. Extraction of Bromelain from Pineapple

In this Project, all the funds were obtained from a PhD Scholarship, financed by "Fundação para a Ciência e a Tecnologia" (FCT[10]). In the following table, the instruments, financing and institution data is provided:

Table 2. Financing and Funds – Bromelain from Pineapple

Technology	*Financing Instrument and Funds*		*Institution(s)*
Bromelain	*PhD Scholarship*	*67.800 € – 100%*	*UCP*

Source 4. *Own Elaboration*

[10] Supports the scientific community in Portugal by providing a variety of financing opportunities for individuals, research teams, and R&D centers. FCT promotes graduate education, research and development, research infrastructure establishment and access, networking and international collaborations, conferences and meetings, science communication, and interactions with industry through its funding schemes (Fundação para a Ciência e a Tecnologia, 2022).

4.2.2. Extraction of Keratin from Pig´s Hair

This Project was totally financed by funds from COMPETE2020[11]. Table 4. provides the financing instrument, funds and institutions responsible for the development and implementation of this technology.

Table 3. Financing and Funds – Keratin from Pig´s Hair

Technology	Financing Instrument and Funds		Institution(s)
Keratin	Funds from COMPETE 2020	33.000 € – 100%	UCP, Riopele, CENTI, CITEVE

Source 5. *Own Elaboration*

4.2.3. Extraction of Peptides from Algae and Microalgae

This first phase of this project was financed by funds from COMPETE 2020 and from the Center of Biotechnology and Fine Chemistry of the Portuguese Catholic University (CBQF). More specifically, 75% of the funds were financed by COMPETE 2020, and the remaining 25% by the Center of Biotechnology and Fine Chemistry of the Portuguese Catholic University. Table 5. provides the financing, funds and the institutions related with this project.

Table 4. Financing and Funds – Peptides from Algae and Microalgae

Technology	Financing Instrument and Funds		Institution(s)
Algae and Microalgae	Funds from COMPETE 2020	35.000 € – 75%	SONAE MC and other(s)

Source 6. *Own Elaboration*

[11] Built in line with the main national and European strategic guidelines, the Competitiveness and Internationalization Operational Program (COMPETE 2020) mobilizes the European Structural and Investment Funds for the period 2014-20 within the scope of the "Competitiveness and Internationalization" domain of Portugal 2020 (COMPETE 2020, 2015).

4.3. Development, Potential, Patents and Implementation

Currently, every project is at an early stage of development, more specifically, the Bromelain and the Algae and Microalgae projects are both, at a laboratory prototype stage. The Keratin project is a step ahead, being that a scale-up of the process was put through with 15 kg of raw material (pig hair residues). This process was carried out in in two phases. The first phase was held at the School of Biotechnology (CBQF), in which, the fat from the pig's hair was removed with Mistolin. The second phase took place at the Polytechnic Institute of Coimbra, at the Agrarian School, and in which the Keratin was separated from the rest. Despite these differences of the stages of development between the projects, it´s important to emphasize that, a spin-off[12] has been created to commercialize the technology or to install equipment for the execution of the technology for the Bromelain project.

These projects are innovative, disruptive and have the potential to reach the stage of industrialization and, subsequently, be commercialized. Bearing this, in order to fulfill reach industrial and commercial levels, the following stages will require a greater amount of financial funds, and this needs to be evaluated and measured by institutions. To gather these funds, a variety of more complex financial instruments should be used, as well as the presence and participation of key players will enlarge. Another relevant aspect of these projects is the markets that they will reach if they fulfill their potential. All of them will be implemented in the Cosmetic sector. But, individually, the extraction of the Bromelain from pineapple and pineapple's peels and steams will reach the Pharmaceutical and Nutraceuticals fields. The Keratin project will be present in the Biomedical and Chemical Aquaculture fields, and the Algae technology will reach the Chemical Aquaculture and the Food Industry. To have a clear picture

[12] Separation of a company's businesses through the formation of one or more distinct, publicly traded companies (Ostling et al., 2016)

of the dimension of these relevant sectors, the next table provides us data of the market size of all of them.

Table 5. Fields Market Size

Industries / Fields / Markets	Market Size (in Million USD $) - 2020
Aquaculture	202.96
Cosmetic	277.67
Food	7.706.412
Medical	456.9
Nutraceuticals	413.0
Pharmaceutical	1.265.2

Source 7. *Own Elaboration. Data collected from Grand View Research*

All fields considered are already quite relevant in terms of their Global economic impact. This is seen by the Market Size of the fields, and more predominantly for the Food, Pharmaceutical and Medical Industries.

In terms of the patents, the Bromelain patent has already been granted at European level by the European Patent Office (EPO)[13], in some countries in Asia, and currently, there is the expectation that between 2023 and 2025, the technology will be implemented. Contrarily, the Keratin and the Algae patents have not been granted yet. Despite this, the Keratin technology is being evaluated by the EPO, and there is also contact with an Italian company, and if the partnership is successful, by 2023 the technology will be licensed and then commercialized.

[13] Reviews European patent applications, allowing inventors, researchers, and companies from all over the world to get protection for their inventions in up to 44 countries via a centralized and uniform process (European Patent Office, 2021).

4.4. Motivations of Circular Economy Projects

In an effort to address resource scarcity, impact on environment, and economic concerns, governments, companies, and societies worldwide are actively pushing the circular economy concept. Bearing this, the following chapters provide some of the advantages of the adoption and development of circular economy projects.

4.4.1. 3Rs - Reduce, Reuse and Recycle

The imperatives of reducing, reusing, recycling, and recovering, which are widely accepted as pillars of the CE, are used to extend the useful lifetime of materials as a fundamental part of CE (Kirchherr et al., 2017). In other words, materials and resources must be used for as long as possible in the economy, extending their lifespan and reducing waste. Recycling is one method of reusing goods and thereby reducing primary resource extraction. This concept has prompted research on the drivers and constraints to waste generation (reduce and reuse implications) and/or recycling (Soukiazis and Proença, 2020; Valenzuela-Levi, 2019). CE is defined by the 3 R's: reduce, reuse, and recycle (Preston, 2012; Lieder and Rashid, 2015; Murray et al., 2015; Jawahir and Bradley, 2016).

According to McDonough and Braungart (2010), during the 1920s, the basic notion of reducing was using fewer resources to produce the same amount of output. But, in the 1980s, within eco-efficiency circles, reducing also meant limiting pollution, emissions, and waste. Manufacturers had historically been held responsible for reducing emissions and resource usage (Stahel W. R., 1982). In the past, products were reused when they were donated to charity organizations as gifts to the less fortunate in society, and today, consumers purchase at second hand stores to contribute to a more sustainable world (Morgan and Mitchell, 2015).

Recycling is the process of converting materials and products that have been discarded as garbage into new items (Jawahir and Bradley, 2016). In addition, as Morgan and Mitchell (2015) mention, closed loop recycling (manufacturing new products from waste without changing the original content of the material used) and open loop recycling (manufacturing new products from waste without changing the original composition of the material used) are two types of recycling (manufacturing new products which are lesser in quality because the materials lose their original composition). Open loop recycling is a fairly common practice. It raises concerns because products are not developed to be easily reused or recycled, and recycling items costs so much money and energy due to their material composition (McDonough and Braungart, 2010; Ellen MacArthur Foundation, 2013). When the products being recycled are valuable and there are procedures in place for their simple collection and reprocessing, recycling is economically profitable (Narayan, 2001). Improving Critical Raw Materials[14] recovery and recycling could provide major benefits to the EU, such as reducing reliance on third-country imports (European Parliament, 2011). In addition, the use of recycled materials may alter demand patterns for primary materials, resulting in less primary material extraction. According to WBCSD Education (2016), companies could use the 3Rs principle to waste streams and extract value from it. All material streams could be perceived as vital resources that should be implemented to their highest potential. In this approach, the company's waste value chain could be converted into a positive spiral of value.

4.4.2. Reduction of Pollution

The CE model strives to achieve production and consumption sustainability by using closed cycles (closed loops) for regeneration and restoration, as well as a combination of maintenance, repair, reuse, renovation, remanufacturing, and

[14] Are raw materials with high economic value and a high risk of supply scarcity (European Comission, 2014).

recycling activities (Bocken et al., 2014; Hazen et al., 2017; Perey et al., 2018). This occurs due to the more efficient resource use and reuse, as well as reduced overall resource inputs, energy, emissions, and waste leakage, could reduce negative environmental consequences without sacrificing growth and prosperity, all while improving the economy, environment, and society's balance (Kiefer et al., 2019; Geissdoerfer et al., 2018; Manninen et al., 2018). Geissdoerfer et al. (2017) refer that closing material loops in industrial ecosystems help ensure that resources are used continuously. Long-term design, proactive maintenance, recycling, repairing, refurbishment, and remanufacturing can all contribute. As a result, the CE model is an economic system of resource recycling and reuse in which element reduction is critical; that is, decreasing output to a minimal level and opting for reutilization of elements that cannot be returned to the environment due to their properties (Geissdoerfer et al., 2017). As previously stated, the goal of this type of closed-loop cyclic system is to eliminate waste by converting end-of-life goods into resources for new ones (Stahel W. R., 2016). The fundamental redesign of materials, products, and value creation processes should dramatically reduce the negative environmental effects of emissions and resource waste that naturally accompany the use of physical goods by optimizing the efficient use of resources (Cheng and Shiu , 2012; Rosa et al., 2019).

Several research on the environmental impacts of the circular economy or resource efficiency are available in the literature. One example of those was developed by Cambridge Econometrics & BIO Intelligence Service (2014), in which they examine the impact of resource productivity targets for the EU at the EU level. According to the study, increasing the EU's resource productivity by 3% would result in a 25% reduction in GHG emissions by 2030. Another study carried out by Lawton et al. (2013) estimated the environmental benefits of material savings in the food and beverage, manufacturing, fabricated metal products, hospitality and food services sectors for the European Commission.

According to the study, boosting resource efficiency in the studied sectors can result in a 2-4 percent reduction in total yearly GHG emissions in the EU. The EMF (2015b), which provides estimates of Denmark, has also conducted a national analysis of environmental benefits. According to the study, Denmark's carbon footprint can be reduced by 3-7[15] percent by implementing a circular economy. Furthermore, by 2035, the study predicted a 5–50 percent reduction in virgin resource consumption.

4.4.3. Improvement in Competitiveness, Innovation and Processes

CE principles frequently require new visions and strategies, as well as a fundamental redesign of product conceptions, service offerings, and channels in order to achieve long-term solutions (Lewandowski, 2016). This aligns with a re-evaluation of suppliers and partners, as well as value chains that prioritize long-term efficiency above short-term efficiency (Geissdoerfer et al., 2018).

The improvement of companies' competitiveness, innovation and their processes are dependent on their Dynamic Capabilities. More specifically, the companies' ability to change their own capabilities, for instance by developing additional products, in response to changes in the external environment (Zahra et al., 2006). Dynamic capabilities include not only capabilities but also the processes and routines of businesses (Barreto, 2010). This implies that, the creation and development of CE skills constitutes an example of the development of the Dynamic Capabilities of Organizations (Aragon-Correa and Sharma, 2003; Bag et al., 2019; Khan et al., 2020; Russo, 2009; Amui et al., 2017; Scarpellini, 2020). CE and environmental management require the integration of a variety of resources and competencies, such as information systems, technological systems, and tacit knowledge. Furthermore, increasing consumer pressure for

[15] This reduction is determined by the "change in worldwide carbon emissions divided by 'business as usual' Denmark carbon emissions" (Ellen MacArthur Foundation, 2015, p. 26).

environmental responsibility has directed companies to improve their responsiveness, flexibility, and ability to change rapidly. Finally, duties that characterize the CE and environmental management include path dependencies and continuous improvement (Russo, 2009; Scarpellini, 2020; Zhu et al., 2013).

Higher rates of technology development, improved materials, labor, energy efficiency, and more profit opportunities for firms are all advantages of a more innovative economy (EMF, 2013).

Proactive environmental initiatives, such as the development of CE models, are dynamic capabilities linked to product and process focused practices (Aragon-Correa and Sharma, 2003). Product-focused practices refer to the development of CE compliant products (Zucchella and Previtali, 2019; Reike et al., 2018; Bocken et al., 2016; Katz-Gerro and Lopez Sintas, 2019; Lewandowski, 2016).

Circularity can be achieved through product life extension practices, which involves a greater focus on the design phase of the product life cycle (Bocken et al., 2016). This means that products and components are created with the purpose of long-term durability and life spans in mind. As the EMF (2012) refers, beyond the implications of circularity on specific sectors, any gain in material productivity is expected to have a significant positive impact on economic development. Circularity has proven to be a promising new frame capable of stimulating creative solutions and increasing innovation rates.

4.4.4. Improvement of the ESG Ratings

Long discussions have raged over how ESG factors influence a business's economic and financial performance, and ultimately its market value. Investing in socially responsible aspects, according to the traditional neoclassical concept, incurs additional costs for companies (Palmer et al., 1995), and is often regarded as a negative factor for economic performance, as the firm's competitiveness may

be harmed (Baumol and Blackman, 1991). Using ESG criteria in investing decision-making has become increasingly significant, particularly for high-profile institutional investors (Cornell et al., 2020). According to Fish et al. (2019), global sustainable assets under management were around $30 trillion in 2019.

In recent years, societal expectations have shifted to the point where a company that solely seeks to maximize shareholder value or concentrates on short-term profits risks losing touch with its consumers and stakeholders over time. Companies must now recognize and address their responsibilities to the world and its resources through the lens of business risk. Transparency, accountability, and sustainability of corporate processes are being improved all around the world (World Travel and Tourism Council, 2017).

According to EMF (2020), the circular economy helps to address many other environmental challenges, including biodiversity loss, societal depletion, natural resource scarcity, pollution, water contamination, and waste, in addition to addressing both the causes and impacts of climate change. Using a circular economy lens can also help achieve goals relating to social and governance issues, such as local job creation, upskilling opportunities, addressing economic injustice and value allocation, and supply chain transparency.

Many researchers have highlighted and recorded the impact of governance on a company's market value, with research findings indicating that there is a positive causal link between good corporate governance and a company's market value (Brown and Caylor, 2006; Bebchuk and Cohen, 2005; Gompers et al., 2003). According to Bassen and Kovacs (2008), ESG indicators are crucial in obtaining additional information about a company's performance that isn't included in accounting data. They define ESG as a non-financial information regarding a company's performance and challenges related to ESG issues, which provides additional relevant data and allows investors to make more informed investment decisions by allowing them to better identify risks and opportunities.

Finally, by implementing CE Projects, firms improve resource allocation, shareholder relationships, governance and, eventually, increase firms market value.

4.4.5. Improvement of the Reputation of Institutions

On the corporate side, there has been a growing awareness of the need to be socially responsible, or at least appear to be socially responsible, either to fend off pressure from interest groups and the media, or to promote themselves to customers (Cornell et al., 2020). Several studies have found a link between environmental, social, and governance factors and non-financial performance predictors such as corporate reputation and brand equity (Hsu, 2012; Cahan, S. et al., 2015).

According to the EMF (2012) companies may build life-long service relationships with their customers instead of one-time transactions. In addition, companies must adjust, as consumers of durable goods have evolved into users. Maintaining smooth operations for providing maintenance, product upgrades, and other product-related services, as well as persuading consumers to return products at the end of each usage cycle, will require new, long-term client connections.

4.4.6. Reduction of Costs

All the previous referred advantages of the development and implementation of CE Projects, Models and lead to the reduction of production costs for companies, and subsequently, lower prices for the intermediate and final consumer.

As mentioned before, in contrast to the traditional linear model, a CE approach is an economic system whose major purpose is to make the best and most sustainable use of resources by increasing efficiency and thereby minimizing

waste. It aims to create value by maximizing resource efficiency and drastically altering production and consumption methods (Kirchherr et al., 2017). Most of the CE literature focuses on the benefits of production (Rizos et al., 2017; Ghisellini et al., 2016).

Manufacturers can save money by remanufacturing their products, and the environment benefits as well because less resources are required (Pigosso et al., 2010).

The recycling of Critical Raw Materials, once a secondary raw-material market is operational, it may improve supply security for businesses and lower production costs (European Parliament, 2011).

According to EMF (2013), companies and consumers are expected to share the net benefits of a more CE. However, the examples in this paper show that the true customer benefits extend beyond the price effect. Improved utility and a lower total cost of ownership are also advantages. In addition, the WBCSD Education (2016) refer that CE projects and business models can reduce costs of production and, in certain cases, provide entirely new profit streams, improve supply chain resilience, and reduce exposure to resource shortages and price volatility. Rentals or leasing contracts, for example, are new business models that build a longer-term engagement with customers. There are also some intangible advantages, such as a better reputation and less risks. Last but not least, financial subsidies and incentives are frequently provided with circular economy initiatives, which can help to strengthen their business case (WBCSD Education, 2016).

	Motivations of Circular Economy Projects					
	3Rs - Reduce, Reuse and Recycle	Reduction of Pollution	Improvement in Competitiveness, Innovation and Processes	Improvement of the ESG Ratings	Improvement of the Reputation of Institutions	Reduction of Production Costs
Authors, Studies and Reports	Stahel W.R. [1982]	Cheng and Shiu [2012]	Aragon-Correa and Sharma [2003]	Baumol and Blackman [1991]	Ellen MacArthur Foundation [2012]	Pigosso et al. [2010]
	Narayan [2001]	Lawton et al. [2013]	Russo [2009]	Palmer et al. [1995]	Hsu [2012]	European Parliament [2011]
	McDonough and Braungart [2010]	Bocken et al. [2014]	Barreto [2010]	Gompers et al. [2003]	Cahan et al. [2015]	Ellen MacArthur Foundation [2013]
	European Parliament [2011]	Cambridge Econometrics & BIO Intelligence Service [2014]	Ellen MacArthur Foundation [2012]	Bebchuk and Cohen [2005]	Cornell et al. [2020]	Ghisellini et al. [2016]
	Preston [2012]	Ellen MacArthur Foundation [2015]	Ellen MacArthur Foundation [2013]	Brown and Caylor [2006]		WBCSD Education [2016]
	Ellen MacArthur Foundation [2013]	Stahel W.R. [2016]	Zhu et al. [2013]	Bassen and Kovacs [2008]		Kirchherr et al. [2017]
	Murray et al. [2015]	Hazen et al. [2017]	Bocken et al. [2016]	World Travel and Tourism Council [2017]		Rizos et al. [2017]
	Morgan and Mitchell [2015]	Geissdoerfer et al. [2017]	Lewandowski [2016]	Fish et al. [2019]		
	Lieder and Rashid [2015]	Geissdoerfer et al. [2018]	Zahra et al. [2016]	Cornell et al. [2020]		
	Jawahir and Bradley [2016]	Manninen et al. [2018]	Amui et al. [2017]	Ellen MacArthur Foundation [2020]		
	WBCSD Education [2016]	Perey et al. [2018]	Geissdoerfer et al. [2018]			
	Kirchherr et al. [2017]	Kiefer et al. [2019]	Reike et al. [2018]			
	Valenzuela-Levi [2019]	Rosa et al. [2019]	Bag et al. [2019]			
	Soukiazis and Proença [2020]		Karl-Gerro and Lopez Sintas [2019]			
			Zuchella and Previtali [2019]			
			Khan et al. [2020]			
			Scarpellini [2020]			

Table 6. Correspondence between the analyzed studies and the Motivations of Circular Economy Projects

5. CONCLUSION

"A shift towards a circular approach is necessary, inevitable, and a superior source of value creation" (Butterworth, 2014).

CE is a growing market, where Companies and Institutions are actively searching for their role. On one hand, this occurs due to the large business opportunities and the reputation of Institutions. But, on other hand, there is a consensus that regulation and policy will become stricter, which will demand a gradual change on the production, methods and on the inputs and outputs of companies. The development and implementation of CE Projects has become a relevant concern, and in some companies and certain institutions, is already a priority.

This study emerges to fulfill the lack of relevant research regarding the impact that finance has on CE Projects and Iniatives. Bearing this, a qualitative approach is used, more specifically, an exploratory examination and inductive approach.

Clinical studies, according to Jensen et al. (1989), help establish the agenda, both in terms of developing theoretical trials and in terms of developing empirical studies. In this regard, we see that the implementation of an empirical study on this topic as an important window of opportunity, based on the underlying motivations of CE Projects and financing instruments, as identified by the clinical study performed in this dissertation.

The motivations that lead to the development of CE projects, that are supported by several authors, determine the financing instruments and funds employed in the Projects. The motivations are the following:

1. 3Rs – Reduce, Reuse and Recycle;
2. Reduction of Pollution;
3. Improvement in Competitiveness, Innovation and Processes;
4. Improvement of the ESG Ratings;
5. Improvement of the Reputation of Institutions;
6. Reduction of Costs.

All these motivations are positively correlated and address resource scarcity, impact on environment, economic concerns, governments, companies, and societies worldwide.

Currently, every project is at an early stage of development, more specifically, the Bromelain and the Algae and Microalgae projects are both, at a laboratory prototype stage, and the Keratin project is a step ahead, and the technology was put through with 15 kg of raw material (pig hair residues). These projects are innovative, disruptive and have the potential to reach the stage of industrialization and, subsequently, be commercialized. Bearing this, all the funds to finance the Bromelain project, were obtained from a PhD Scholarship, financed by FCT. Thus, both the Keratin from pig´s hair and Peptides from Algae and Microalgae were obtained from COMPETE 2020 and supported by remarkable Institutions. In order to fulfill their potential and reach industrial and commercial levels, the following stages will require a greater amount of financial funds, and this needs to be evaluated and measured by Institutions. To gather these funds, a variety of more complex financial instruments, as suggested in Table 2, should be considered, as well as the presence and participation of key players. In terms of the patents, the Bromelain patent has already been granted at European level by the European Patent Office (EPO), in some countries in Asia, and currently, there is the expectation that between 2023 and 2025, the technology will be implemented. Contrarily, the Keratin and the Algae patents

have not been granted yet. Despite this, the Keratin technology is being evaluated by the EPO, and there is also contact with an Italian company, and if the partnership is successful, by 2023 the technology will be licensed and then commercialized.

Taking all this into account, due to the empirical analysis carried out and the potential of each of the 3 projects, this study allows us to assess that the circular economy, the instruments and motivations underlying its financing are crucial for the success of institutions and society. This implies that CE will have to be more fed, so that in the long-term, there are less and less obstacles and, consequently, the financing of CE projects is seen as a vital aspect for Institutions and that it allows them to gain even more notoriety, in comparison with their competitors.

6. RECOMMENDATIONS FOR FURTHER RESEARCH

The shift to a CE is in its early days. Most, markets, regulations, financing instruments, funds, investment tools, and procedures, including financial risk assessment, are tailored to linear economies.

The analysis of data in Clinical Studies are mostly limited to the Institutions being examined. In the future, the scope of research may be extended to include more firms, institutions, and projects from multiple markets. Furthermore, the use of quantitative data in relation to CE Project financing could be another option to broaden the scope of future research.

Another recommendation regards the creation of favorable framework conditions for the development and implementation of CE Projects via specific legal reforms, such as the development of national, regional, business benchmarks and indicators.

The final recommendation concerns the financial sector. This sector should increase its awareness and knowledge of the CE by clearly labeling financial products suitable for financing circular economy projects.

REFERENCES

Acheampong, J. (2016). Green Financing: Financing Circular Economy Companies. Case Studies of Ragn-Sellsföretagen AB and Inrego AB. *Master of Science Thesis*.

Alfredsson, E., & Wijkman, A. (2014). The Green, Inclusive Economy: Shaping society to serve sustainability - minor adjustments or a paradigm shift? Prestudy for Mistra, Key Issues for a Green Economy.

Amui, L. B., Jabbour, C. J., Jabbour, A., & Kannan, D. (2017, January 20). Sustainability as a dynamic organizational capability: a systematic review and a future agenda toward a sustainable transition. *Journal of Cleaner Production, 142*(1), 308-322.

Aragon-Correa, J. A., & Sharma, S. (2003, January). A contingent resource-based view of proactive corporate environmental strategy. *Academy of Management Review, 28*(1), 71-88.

Bag, S., Gupta, S., & Foropon, C. (2019, April 8). Examining the role of dynamic remanufacturing capability on supply chain resilience in circular economy. *Management Decision, 57*(4), 863-885.

Bakken, R. (2021, August 9). *What Is Sustainable Finance and Why Is It Important?* Retrieved March 6, 2022, from Harvard Extension School: https://extension.harvard.edu/blog/what-is-sustainable-finance-and-why-is-it-important/

Banton, C. (2020, September 29). *Mass Production*. Retrieved February 11, 2022, from Investopedia: https://www.investopedia.com/terms/m/mass-production.asp

Barreto, I. (2010). Dynamic capabilities: a review of past research and an agenda for the future. *Journal of Management*, 256-280.

Bassen, A., & Kovacs, A. M. (2008). Environmental, social and governance key performance indicators from a capital market perspective. *Zeitschrift für Wirtschafts- und Unternehmensethik, 9*(2), 182-192.

Baumol, W. J., & Blackman, S. A. (1991). Perfect markets and easy virtue: Business ethics and the invisible hand. *USA: B. Blackwell*.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report, 13*, 544-559.

Bebchuk, L. A., & Cohen, A. (2005). The costs of entrenched boards. *Journal of Financial Economics, 78*(2), 409-433.

Behrens, A., Giljum, S., Kovanda, J., & Niza, S. (2007, December 15). The material basis of the global economy: Worldwide patterns of natural resource extraction and their implications for sustainable resource use policies. *Ecological Economics, 64*(2), 444-453.

Blomsma, F., & Brennan, G. (2017, June). The emergence of Circular Economy: A New Framing Around Prolonging Resource Productivity. *Journal of Industrial Ecology, 21*(3), 603-614.

Bocken, N. M., Pauw, I. d., Bakker, C., & Grinten, B. v. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering, 33*(5).

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

Bortolotti, B., D` Souza, J., Fantini, M., & Megginson, W. (2001). Sources of Performance Improvement in privatised Firms: A Clinical Study of the Global telecommunications Industry. *SSRN Electronic Paper Collection*.

Bortolotti, L. (2015). *Circular economy, an act of courage to rethink the system*. Retrieved March 15, 2022, from http://www.italiachecambia.org/2015/11/economia-circolare-coraggio-ripensare-sistema/

Brealey, R. A., Myers, S. C., & Marcus, A. J. (2001). Fundamentals of Corporate Finance, 3rd ed. *McGraw-Hill Irwin Education: Boston, MA*.

Brown, L., & Caylor, M. (2006). Corporate governance and firm valuation. *Journal of Accounting and Public Policy, 25*(4), 409-434.

Brunori, C., Cremisini, C., Massanisso, P., Pinto, V., & Torricelli, L. (2005, January). Reuse of a treated red mud bauxite waste: studies on environmental compatibility. *Journal of Hazardous Materials, 117*(1), 55-63.

Burton, I. (1987). Our common future: The world commission on environment and development. *Environment, 29*(5), 25-29.

Butterworth, J. (2014). *CEC Mentors Program*. Retrieved March 28, 2022, from Circular Economy Club: https://www.circulareconomyclub.com/cec-mentors-program/mentoring-competition-jamie-butterworth/

Buysschaert, A., Deloof, M., & Jegers, M. (2004). Equity sales in Belgian corporate groups: expropriation of minority shareholders? A clinical study. *Journal of Corporate Finance, 10*, 81-103.

Cahan, S. F., Chen, C., Chen, L., & Nguyen, N. H. (2015). Corporate social responsibility and media coverage. *Journal of Banking & Finance, 59*, 409-422.

Cambridge Econometrics and BIO Intelligence Service. (2014). Study on modelling of the economic and environmental impacts of raw material consumption. *Final Report prepared for the European Commission*.

Capital.com. (2022, March). *External Financing*. Retrieved March 5, 2022, from Capital.com: https://capital.com/external-financing-definition

Capital.com. (2022, March). *Internal Financing*. Retrieved March 5, 2022, from Capital.com: https://capital.com/internal-financing-definition

Cheng, C. C., & Shiu, E. C. (2012). Validation of a proposed instrument for measuring eco-innovation: an implementation perspective. *Technovation, 32*(6), 329-344.

Circle Economy. (2017). The circular economy for investors. *Circle Economy*.

Commoner, B. (1972). *The Environmental Cost of Economic Growth* (Vol. 3). (R. G. Ridker, Ed.) Washington DC, United States of America: Population. Resources and the Environment.

COMPETE 2020. (2015, March 15). *About us*. Retrieved from COMPETE 2020: https://www.compete2020.gov.pt/sobre-nos

Cornell, B., & Damodaran, A. (2020, March). Valuing ESG: Doing Good or Sounding Good?

Cumming, G. S., & Cramon-Taubadel, S. v. (2018, September 5). Linking economic growth pathways and environmental sustainability by understanding development as alternate social–ecological regimes. (S. A. Levin, Ed.) *Proceedings of the National Academy of Sciences of the United States of America, 115*(38), 9533-9538.

Daly, H. E. (1990, April). Toward some operational principles of sustainable development. *Ecological Economics, 2*(1), 1-6.

Dissanaike, G., & Papazian, A. (2005). Management Turnover in Stock Market Winners and Losers: A Clinical Investigation. *ECGI*(61).

ECGI. (2022). *About ECGI*. Retrieved February 11, 2022, from ECGI: https://ecgi.global/content/about-ecgi

Elia, V., Gnoni, M. G., & Tornese, F. (2017, January 20). Measuring circular economy strategies through index methods: A critical analysis. *Journal of Cleaner Production, 142*(4), 2741-2751.

Ellen MacArthur Foundation. (2012). *Towards the circular economy - Economic and business rational for an accelerated transition* (Vol. 1). Isle of Wight, United Kingdom. Retrieved 2021, from Ellen MacArthur Foundation: https://emf.thirdlight.com/link/x8ay372a3r11-k6775n/@/preview/1?o

Ellen MacArthur Foundation. (2013). Towards the Circular Economy - Opportunities for the Consumer Goods Sector. *Ellen Macarthur Foundation*.

Ellen MacArthur Foundation. (2015a). Growth Within: A Circular Economy Vision for a competitive Europe. *Ellen MacArthur Foundation*.

Ellen MacArthur Foundation. (2015b). *Potential for Denmark as a Circular Economy. A Case Study From: Delivering the Circular Economy*. Retrieved from https://tinyurl.com/zv8exrl

Ellen MacArthur Foundation. (2015c). *Towards a Circular Economy: business rationale for an accelerated transition*. Retrieved March 2022, from https://ellenmacarthurfoundation.org/towards-a-circular-economy-business-rationale-for-an-accelerated-transition

Ellen MacArthur Foundation. (2020). Financing the Circular Economy: Capturing the opportunity . *Ellen MacArthur Foundation*.

Esty, B. (1999). A Case Study of the Effective Use of Project Finance. *Journal of Applied Corporate Finance, 12*(3), 26-42.

EU Comission, & Ministry of Environment of Japan. (2019). *Report on Sustainable Finance for a Circular Economy - G20 Resource Efficiency Dialogue 2019.* Japan/EU Joint Workshop, Tokyo.

EU Commission. (2014). *Towards a Circular Economy: a Zero Waste Programme for Europe.* Brussels.

European Comission. (2014). Communication on the review of the list of critical raw materials for the EU and the implementation of the Raw Materials Initiative. *Communication from the Commission to the European Parliament,*

the Council, the European Economic and Social Committee and the Committee of the Regions, COM, 297.

European Comission. (2019, March). Accelerating the transition to the Circular Economy - Improving access to finance for circular economy projects. *European Comission*.

European Investment Bank. (2015). Assessment of access-to-finance conditions for projects supporting Circular Economy. *European Investment Bank*.

European Parliament. (2011). *Report on an effective raw materials strategy for Europe.*

European Patent Office. (2021, August 12). *The EPO at a glance*. Retrieved from European Patent Office: https://www.epo.org/about-us/at-a-glance.html

Export Leadership Forum. (2015). *Circular Economy: From Waste to Wealth*. Retrieved March 15, 2022, from http://blog.exportleadership.com/2015/11/04/the-circular-economy-from-waste-to-wealth/

Figge, F., Thorpe, A. S., Givry, P., Canning, L., & Franklin-Johnson, E. (2018, May 2). Longevity and Circularity as Indicators of Eco-Efficient Resource Use in the Circular Economy. *Ecological Economics*, 297-306.

Fish, A., Kim, D. H., & Venkatraman, S. (2019). The ESG sacrifice.

Folger, J. (2021, January 18). *What is an NGO (Non-Governmental Organization)?* Retrieved February 11, 2022, from Investopedia: https://www.investopedia.com/ask/answers/13/what-is-non-government-organization.asp

Franklin-Johnson, E., Figge, F., & Canning, L. (2016, October 1). Resource duration as a managerial indicator for Circular Economy performance. *Journal of Cleaner Production, 133*, 589-598.

Fundação para a Ciência e a Tecnologia. (2022). *Funding*. Retrieved March 14, 2022, from FCT - Fundação para a Ciência e a Tecnologia: https://www.fct.pt/apoios/index.phtml.en

Geissdoerfer, M., Morioka, S. N., de Carvalho, M. M., & Evans, S. (2018). Business Models and supply chains for the circular economy. *Journal of Cleaner Production, 190*, 712-721.

Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The circular economy - a new sustainability paradigm? *Journal of Cleaner Production, 143*, 757-768.

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

Gompers, P., Ishii, J., & Metrick, A. (2003). Corporate governance and equity prices. *The Quartely Journal of Economics, 118*(1), 107-156.

Goovaerts, L., & Verbeek, A. (2018). Sustainable Banking: Finance in the Circular Economy. *Investing in Resource Efficiency*.

Goovaerts, L., Schempp, C., Busato, L., Smits, A., Zutelija, L., & Piechocki, R. (2018). Financing Innovation and Circular Economy. *European Investment Bank*.

Green, D. I. (1894, January 1). Pain-Cost and Opportunity-Cost. *The Quarterly Journal Of Economics, 8*(2), 218-229.

Hardi, P., & Zdan, T. (1997). Principles and practice. Assessing Sustainable Development . *International Institute for Sustainability* .

Hazen, B. T., Mollenkopf, D. A., & Wang, Y. (2017). Remanufacturing for the circular economy: an examination of consumer switching behaviour. *Business Strategy and the Environment, 26*, 451-464.

Hicks, C., Dietmar, R., & Eugster, M. (2005, July). The recycling and disposal of electrical and electronic waste in China—legislative and market responses. *Environmental Impact Assessment Review, 25*(5), 459-471.

Hsu, K. (2012). The advertising effects of corporate social responsibility on corporate reputation and brand equity: Evidence from the life insurance industry in Taiwan. *Journal of Business Ethics, 109*(2), 189-201.

ING. (2015). Rethinking finance in a circular economy. Financial implications of circular business models. *ING Economics Department*.

ING. (2015). Rethinking finance in a circular economy. Financial implications of circular business models. *ING Economics Department*.

Jawahir, I. S., & Bradley, R. (2016). Technological Elements of Circular Economy and the Principles of 6R-Based Closed-loop Material Flow in Sustainable Manufacturing. *Procedia CIRP, 40*, 103-108.

Jensen, M. C., Fama, E. F., Jr., J. B., Ruback, R. S., Schwert, G. W., Jr., C. W., & Warner, J. (1989). Editorial: Clinical Papers and Their Role in the Development of Financial Economics. *Journal of Financial Economics, 24*, 3-6.

Journal of Financial Economics. (2022). *Journal of Financial Economics*. Retrieved February 11, 2022, from Journal of Financial Economics: https://www.jfinec.com

Katz-Gerro, T., & Lopez Sintas, J. (2019, May). Mapping circular economy activities in the European Union: Patterns of implementation and their correlates in small and medium-sized enterprises. *Business Strategy and the Environment, 28*(4), 485-496.

Kenton, W. (2020, November 29). *Imperfect Market*. Retrieved March 5, 2022, from Investopedia: https://www.investopedia.com/terms/i/imperfectmarket.asp

Khan, O., Daddi, T., & Iraldo, F. (2020, January 15). Microfoundations of dynamic capabilities: Insights from circular economy business cares. *Business Strategy and the Environment , 29*(3), 1479-1493.

Khemani, R. S., & Shapiro, D. M. (1993). Glossary of Industrial Organisation Economics and Competition Law. *Directorate for Financial, Fiscal and Enterprise Affairs - OECD*.

Kiefer, C., Del Rio, P., & Carrillo-Hermosilla, J. (2019). Drivers and barriers of eco-innovation types for sustainable transitions: a quantitative perspective. *Business Strategy and the Environment, 28*(1), 155-172.

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: an analysis of 114 definitions. *Resources, Conservation and Recycling, 127*, 221-232.

Klassen, R. D., & McLaughlin, C. P. (1996). The impact of environmental management on firm performance. *Management Science, 42*(8), 1199-1214.

Kono, N. (2014). Brundtland Commission (World Commission on Environment and Development). *Encyclopedia of Quality of Life and Well-Being Research*.

Kotsantonis, S., & Serafeim, G. (2019). Four Things No One Will Tell You About ESG Data. (Spring, Ed.) *Journal of Applied Corporate Finance, 31*(2), 50-58.

Lancaster, M. (2002). Principles of sustainable and green chemistry. *Handbook of green chemistry and technology*.

Lawton, K., Carter, C., Lee, J., Tan, A., Trigo, A. d., Luscombe, D., & Briscoe, S. (2013). The opportunities to business of improving resource efficiency. *AMEC Environment & Infrastructure and Bio Intelligence Service for the European Commission*.

Leontief, W. (1991, June). The economy as a circular flow. *Structural Change and Economic Dynamics, 2*(1), 181-212.

Lewandowski, M. (2016). Designing the business models for circular economy - towards the conceptual framework. *Sustainability, 8*(43).

Lieder, M., & Rashid, A. (2015). Towards circular economy implementation: a comprehensive review in context of manufacturing industry. *Journal of Cleaner Production*.

Malthus, T. R. (1798). *An Essay on the Principle of Population* . Cambridge University Press.

Manninen, K., Koskela, S., Antikainen, R., Bocken, N., Dahlbo, H., & Aminoff, A. (2018). Do circular economy business models capture intended environmental value propositions? *Journal of Cleaner Production, 171*, 413-422.

Manyika, J., Chui, M., Bughin, J., Dobbs, R., Bisson, P., & Marrs, A. (2013, May 1). *Disruptive technologies - Advances that will transform life, business, and the global economy*. (Mckinsey Global Institute) Retrieved October 8, 2021, from McKinsey & Company: https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/disruptive-technologies

McConnell, J., & Schwartz, E. (1992). The Origin of LYONs: A Case Study in Financial Innovation. *Journal of Applied Corporate Finance, 4*, 40-47.

McDonough, W., & Braungart, M. (2010). Cradle to cradle: Remaking the way we make things. MacMillan.

Meadows , D. H., Randers, J., & Meadows, D. L. (1972). *The Limits to Growth.* New York: Universe Books.

Michalos, A. C. (2014). *Encyclopedia of quality of life and well-being research.* Dordrecht, Netherlands : Springer.

Mikócziová, J. (2010). Sources of investment finance in firms in Slovakia. *Journal of Competitiveness, 2*(1).

Mills, R.;. (2005). Assessing Growth Estimates in IPO Valuations – A Case Study. *Journal of Applied Corporate Finance, 17*(1), 73-78.

Morgan, J., & Mitchell, P. (2015). *Employment and the circular economy: Job creation in a more resource efficient Britain*. Retrieved March 2022, from http://www.green-alliance.org.uk/resources/Employment%20and%20the%20circular%20economy.pdf

Murray, A., Skene, K., & Haynes, K. (2015). The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Contex. *Journal of Business Ethics, 140*, 1-12.

Myers, N., & Kent, J. (2003, April 15). New consumers: The influence of affluence on the environment. *Proceedings of the National Academy of Sciences of the United States of America, 100*(8), 4963-4968.

Narayan, R. (2001). Drivers for biodegradable/compostable plastics and role of composting in waste management and sustainable agriculture. *Bioprocessing of Solid Waste and Sludge, 11*(1).

OECD. (1997). Regulatory Reform: A Synthesis. p. 11.

Ostling, G., Wachtell, Lipton, Rosen, & Katz. (2016, March 26). *2016 Spin-Off Guide*. Retrieved from Harvard Law School Forum on Corporate Governance : https://corpgov.law.harvard.edu/2016/03/26/2016-spin-off-guide/

Palmer, K., Oates, W., & Portey, P. R. (1995). Tightening environmental standards: the benefit-cost or the no-cost paradigm? *Journal of Economic Perspectives, 9*(4), 119-132.

Pearce, D. W., & Turner, R. K. (1989). Economics of Natural Resources and the Environment. *Johns Hopkins University Press*.

Pearce, D. W., & Turner, R. K. (1990). *Economics of Natural Resources and the Environment* . Baltimore: The Johns Hopkins University Press.

Pearce, D., & Turner, R. (1989). Economics of Natural Resources and the Environment . *Johns Hopkins University Press*.

Perey, R., Benn, S., Agarwal, R., & Edwards, M. (2018). The place of waste: changing business value for the circular economy. *Business Strategy and the Environment, 27*(5), 631-642.

Pigosso, D. C., Zanette, E., Ometto, A. R., & Rozenfeld, H. (2010). Ecodesign methods focused on remanufacturing. *Journal of Cleaner Production, 18*(1), 21-31.

Planing, P. (2015). Business Model Innovation in a Circular Economy Reasons for Non- Acceptance of Circular Business Models. *Open Journal Of Business Model Innovation*.

Porter, M. (n.d.). *Making Strategic Trade-offs*. Retrieved February 23, 2022, from Harvard Business School: https://www.isc.hbs.edu/strategy/creating-a-successful-strategy/Pages/making-strategic-trade-offs.aspx

Preston, F. (2012, March). A Global Redesign? Shaping the Circular Economy. *Energy, Environment and Resource Governance*.

Prieto-Sandoval, V., Jaca, C., & Ormazabal, M. (2018, April 1). Towards a consensus on the circular economy. *Journal of Cleaner Production, 179*, 605-615.

Reike, D., Vermeulen, W. J., & Witjes, S. (2018, August). The circular economy: New or Refurbished as CE 3.0? — Exploring Controversies in the Conceptualization of the Circular Economy through a Focus on History and Resource Value Retention Options. *Resources, Conservation and Recycling, 135*, 246-264.

Rhode, C. (2017). An Economy Transitioning from Brown to Green. *Ifo Institute – Leibniz Institute for Economic Research at the University of Munich, 15*(3), 51-55.

Rizos, V., Behrens, A., Kafyeke, T., Hirschnitz-Garbers, M., & Ioannou, A. (2015). The Circular Economy: Barriers and Opportunities for SMEs. *CEPS Working Documents*.

Rizos, V., Tuokko, K., & Behrens, A. (2017). The Circular Economy: A Review of Definitions, Processes and Impacts. *Centre for European Policy Studies, 1*.

Rommens, A., Deloof, M., & Jegers, M. (2003). Why do Holding Companies Trade at a Discount? A Clinical Study. *Belgian Financial Research Forum – Diepenbeek*.

Rosa, P., Sassanelli, C., & Terzi, S. (2019). Towards circular business models: a systematic literature review on classification frameworks and archetypes. *Journal of Cleaner Production, 236*.

Russo, M. V. (2009, July 11). Explaining the impact of ISO 14001 on emission performance: a dynamic capabilities perspective on process and learning. *Business Strategy and the Environment, 18*(5), 307-319.

Sariatli, F. (2017). Linear Economy versus Circular Economy: A Comparative and Analyzer Study for Optimization of Economy for Sustainability. *Visegrad Journal on Bioeconomy and Sustainable Development*.

Scarpellini, S., Valero-Gil, J., Moneva, J., & Andreaus, M. (2020). Environmental management capabilities for a "circular eco-innovation". *Business Strategy and the Environment*.

Scheel, C. (2016, September 10). Beyond sustainability. Transforming industrial zero-valued residues into increasing economic returns. *Journal of Cleaner Production, 131*, 376-386.

Schomaker, A. (2019). *Report on Sustainable Finance for a Circular Economy - Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019.* Tokyo.

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

Schwarz, M. (2016). *A Sustainist Lexicon.* Architectura & Natura .

Soukiazis, E., & Proença, S. (2020, August). The determinants of waste generation and recycling performance across the Portuguese municipalities – a simultaneous equation approach. *Waste Management, 114*, 321-330.

Stahel, W. R. (1982). The product life factor. An Inquiry into the Nature of Sustainable Societies: The Role of the Private Sector. *Series: 1982 Mitchell Prize Papers, NARC*.

Stahel, W. R. (2016, March 23). The circular economy. *Nature News*(531), 435-438.

Su, B., Heshmati, A., Geng, Y., & Yu, X. (2013, March). A review of the circular economy in China: moving from rhetoric to implementation. *Journal of Cleaner Production, 42*, 215-227.

Swedish Center for Business and Policy Studies. (2022). *About SNS*. Retrieved February 23, 2022, from SNS: https://www.sns.se/en/about-sns/

Ueda, Y. (2019). *Report on Sustainable Finance for a Circular Economy - Japan/EU Joint Workshop G20 - Resource Efficiency Dialogue 2019.* Tokyo.

United Nations. (2022). *About Us*. Retrieved February 11, 2022, from United Nations: https://www.un.org/en/about-us

United Nations Conference on Trade and Development. (2021). *World Investment Report - 2021 - Investing in Sustainable Recovery.* New York: United Nations.

United Nations Environment Programme. (2012). Global Environment Outlook 5: Environment for the future we want. *United Nations Environment Programme*.

United Nations System Staff College. (2017, February). The 2030 Agenda for Sustainable Development. *United Nations System Staff College Knowledge Centre for Sustainable Development* , 1-2.

University Of Boras. (2022). *Handelsbankens forskningsstiftelser (Jan Wallander and Tom Hedelius foundation, Tore)*. Retrieved February 23, 2022, from HB: https://www.hb.se/en/research/research-portal/funders/handelsbankens-forskningsstiftelser-jan-wallander-and-tom-hedelius-foundation-tore-browalds-foundation/

Uzsoki, D. (2020, February). Sustainable Investing: Shaping the future of finance. *International Institute for Sustainable Development*.

Valenzuela-Levi, N. (2019, November). Factors influencing municipal recycling in the Global South: the case of Chile. *Resources, Conservation and Recycling, 150*.

WBCSD Education. (2016). Unlocking More Value with Fewer Resources - A practical guide to the Circular Economy. *WBCSD Leadership Program*.

Wijkman, A., & Skånberg, K. (2015). The Circular Economy and Benefits for Society. Jobs and Climate Clear Winners in an Economy Based on Renewable Energy and Resource Efficiency. A study pertaining to Finland, France, the Netherlands, Spain and Sweden. *Club of Rome*.

Wijkman, A., & Skanberg, K. (2015). The Circular Economy and Benefits for Society: Jobs and Climate Clear Winners in an Economy Based on Renewable Energy and Resource Efficiency. A study pertaining to Finland, France, the Netherlands, Spain and Sweden. *The Club of Rome*.

World Travel and Tourism Council. (2017). *Understanding the critical issues for the future of travel and tourism, 2017*. Retrieved from WTTC: www.wttc.org

Zahra, S. A., Sapienza, H. J., & Davidsson, P. (2006). Entrepreneurship and dynamic capabilities: a review, model and research agenda. *Journal of Management Studies, 43*(4), 917-955.

Zhu, Q., Cordeiro, J., & Sarkis, J. (2013). Institutional pressures, dynamic capabilities and environmental management systems: Investigating the ISO 9000 – Environmental management system implementation linkage. *Journal of Environmental Management, 114*(15), 232-242.

Zimmerer, T., Scarborough, N. M., & Wilson, D. (2002). Essentials of entrepreneurship and small business management. *Upper Saddle River, NJ: Prentice Hall*, 1-3.

Zucchella, A., & Previtali, P. (2019, February). Circular business models for sustainable development: A "waste is food" restorative ecosystem. *Business Strategy and the Environment, 28*(2), 274-285.