
MAINSTREAMING SUSTAINABLE DEEP TECH VENTURE CAPITAL

A MULTIPLE COMPARATIVE CASE STUDY OF DEEP TECH VENTURE CAPITAL FUNDS'
SUSTAINABILITY FRAME INSTITUTIONALIZATION

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Summary

This thesis was written in the context of the master specialization Corporate Sustainability as part of a graduation assignment for HightechXL. It investigates the position and trajectory of sustainability in deep tech venture capital (VC) funds.

The need for sustainable innovation is highly underpinned by industry, government, and society. Startups can play a vital role in developing and implementing innovative deep technological solutions to the Sustainable Development Goals. However, deep tech startups face relatively high risks due to longer development cycles, higher cost of capital, and slow market development than more traditional startups. Risks that VC investors are most experienced in. It is therefore essential to redirect VC investment streams to sustainable innovation.

This study reveals insight into how deep tech VCs now see sustainability and how this influences investment decisions. Through combining theoretical and empirical research, I have tried to answer the main research question: *What is the position and trajectory of sustainability in venture capital funds in the deep tech industry?*

A literature study on sustainable deep technological innovation, responsible and sustainable investment perspectives and the VC model provided input for a conceptual model. The frame institutionalization theory by Gray, Purdi & Ansari (2015) formed the basis. As a result, the theoretical framework led to an important insight by providing four theorized frame transition patterns, two of which positively affect the mainstreaming of sustainable investment: moral duty 'revolution' and opportunistic 'evolution'. Two other patterns negatively affect traditional investment 'status quo' and segmented 'power sharing'. Crucial characteristics of these patterns are whether the interactant wants to change or maintain field legitimacy, whether the interactant perceives power domination as episodic or systemic, and which micro framing processes can be detected. The research question has been revisited to include this theoretical insight into *'What frame institutionalization patterns for sustainable investment are prominent in the deep tech venture capital industry?'*

These four patterns and corresponding indicators were the base for the empirical research conducted in five Dutch deep tech funds. Ten in-depth interviews and background documents have been analyzed using pre-defined codes corresponding with the indicators for frame transition patterns in the coding program Atlas.ti. The results are presented in five case studies, each discussing the traces of frame transition patterns that were detected, the materialization of sustainability in business practices, and a conclusion on the primary frame institutionalization pattern in that case. A cross-case analysis shows the differences and similarities between the cases and provides input for the conclusion on the research question.

The results show that Dutch deep-tech VC funds all show traces of the opportunistic 'evolution' frame institutionalization pattern, while some are close to the moral duty 'revolution' pattern. The funds challenge the legitimacy of capital, thus VCs, in a world that nowadays fails to sustain for future generations. The perceived power domination in the field is ambiguous. On one hand, incumbent and traditional market players define the outdated concept of economics that the VCs need to cope with; on the other hand, they feel they have some power to change frames as a manager of assets for larger financial institutions. A primary framing mechanism was 'merging frames' of disruptive innovation and sustainable development. This is based on similarities in the development cycle, market entry and potential societal impact of deep-tech innovations and solutions to large societal challenges. The funds show different levels of practical integration of sustainability, mostly related to the selection criteria of an investment. Environment, social and governance (ESG) related management of the startups' daily

operations is desired by all funds. Yet, they struggle in execution as common ESG knowledge does not include the young business perspective. In conclusion, Dutch deep tech VC funds participate in mainstreaming the sustainable investment frame by reframing the purpose of deep tech to make a disruptive societal impact.

The theoretical framework proved to be effective in answering the research question. However, it appeared that indicators of the two negative frame institutionalization patterns were more difficult to recognize due to the nature of the data collection method. More dedicated research on ways of countering the sustainability frame could be interesting. Future research could also investigate external factors that increase the mainstreaming, such as regulation and prominent financial players divesting from non-sustainable assets.

Preface

Personally, this project has undoubtedly raised more questions than it was able to answer. Operating on the verge of traditional market capitalism and future-proof innovation has proven to be quite complex. At this point in history (or future), we are still constraint to existing market principles and need to be able to use them to the advantage of sustainable development – while knowing it is precisely these mechanisms that have caused so many of nowadays miseries and non-sustainable practices. This ambivalence has proven to be challenging on personal, academic, and organizational level – and anywhere in between. This process has forced me into reconsidering my position in this wicked problem and where to be most effective. When I consider the market's strengths as an engine for innovation, doesn't that make me a capitalist? And when I am investigating a completely new model of value and well-being, where does that fit my belief in technological innovation? Working on this thesis has forced me to distinguish between the philosophical and academic questions that I believe will benefit our society and planet, and the pragmatic day-to-day impact I can make. Maybe that leaves me a pragmatic idealist?

I am grateful to have spent the time on this topic that has really challenged my way of thinking while seriously gaining insight in a field that is transforming right under my eyes.

I am even more grateful to all the people around me that supported me in finalizing this project when sometimes personal circumstances made it close to impossible to see the end of it. Knowing they made time and mental space to help me the way they did, is even more valuable than their actual contribution. Thank you, Stef, Guus, Colette, Susan, Suzan, Ida, Margot, Det, Dieuwertje, Lidwien, Frederike, Helga, Silvijn, Hannah, Andrea, Johan, Huub, Rikke and Olav.

I am looking forward to continuing learning and reframing in my role as a sustainability and impact officer for a deep tech investment fund.

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1 INTRODUCTION

1.1 GLOBAL SOCIETAL CHALLENGES AND TECHNOLOGICAL INNOVATION

Many research institutions, international organizations, governmental and non-governmental organizations agree that climate change is the number one environmental threat to the persistence of today's society. Climate change in short can be described as a rise in temperature in Earth's atmosphere due to an excess in GHG, caused by both human and natural processes that emit gases such as carbon dioxide (CO₂) and nitrogen (N) varieties. The impacts of climate change are manifold, caused by amongst other a rise in sea water levels, desertification, and extreme weather conditions. Floods and droughts, entire islands in the Pacific Ocean disappearing and an increase in destructive hurricanes are already causing socio-economic issues such as food- and freshwater shortages, the necessity to move home (climate refugees) and intensified situations of conflict (Mach et al., 2019). The social inequality, or 'climate apartheid', in the capacity of mitigation and adaptation to climate change is making the situation even more difficult when comparing on a global level (Mach et al., 2019). In addition, forecasts show us that the ever-growing global economy and its environmental footprint are going to accelerate climate change processes and impacts on a scale that is difficult to grasp. But what if we could change the negative impact of the economy towards a positive force for innovation?

Today's challenges towards a livable world for all, today and in future generations, are often linked to the market principle of consumption and production. Climate change, decline in biodiversity, the extinction of raw materials and ever-increasing social inequity can all be linked to industry. Ever since the industrial revolution but mostly since the 1950s, a 'great acceleration' in industrial and socio-economic processes is set in parallel to a great acceleration of earth system trends, a.o. toxic greenhouse gasses (GHG) in the air, use of energy, use of water, use of raw materials, land-use change, water pollution and many more. Besides the environmental pressures, the past century has increased global inequalities in wealth, health, and autonomy.

The idea that capitalistic systems and industrialization are the cause of global societal issues is established, however the belief that elements of those systems, such as entrepreneurship, financing and technological innovation can be part of the solution to these global challenges, is rising too.

The example of climate change serves well in explaining the interconnection between global challenges, not only in its effects but also in its solutions. Change in economic processes, technological innovation and political action are all seen as crucial towards the 'sustainable development' of our world (DNB, 2018). The United Nations (UN) have phrased the goal of sustainable development as a process of combining efforts on market, societal and country level to innovate on 17 Sustainable Development Goals (SDGs) that are linked to social equality, economic progress, and the environment. At the core of this approach is the need for global collaboration and the appreciation that responding to climate change and other environmental pressures goes hand in hand with the eradication of poverty, an increase in well-being, as well as global economic progress. Another key element to the SDGs is the fact that it acknowledges that sustainable progress is no longer a quest of developing countries alone, but now includes the responsibility and challenges that developed countries share. The global goals are essentially a strategy towards a stable, future proof society on a global level,

something that every stakeholder in a society should aim towards, if not only for their own benefits.

Fitting in the context and implementation of these goals, different international and national policies are being introduced on actionable levels. For example, in 2015 the Paris Agreement was set between the larger part of countries all over the world in which agreements were made to avoid a global temperature increase going over 2.0 degrees Celsius. Today, different national governments have integrated these goals in a national climate law, including examples like the Netherlands and New Zealand. Moreover, in December 2019 the European Union heads of state accepted the European Green Deal, in which the goal to have a carbon neutral continent in 2050 has been secured and support for a total market transformation was included (European Commission, 2019). The EU green deal includes targets on energy consumption reduction and the share of renewable energies. In 2017 we were still 17,4% away from our pre-green deal 2030 target on energy consumption (the equivalent of 166,3 Mtoe)(Eurostat, 2019), while in the summer of 2020 the target has been increased to up to 50% reduction of GHG emissions (European Commission, 2019).

This leads us back to the market mechanisms that need to reset their purpose. All targets set, this is an incredible appeal to research institutions and markets to come forward with economically viable solutions to reach these targets. This aspect of 'mobilizing research and fostering innovation' is clearly mentioned in the Green Deal. More and more regulation and incentives direct towards a drastic decrease in GHG emissions and other environmental pressures such as pollution and over-exploitation of resources. Similarly, the market is adopting more socially responsible ambitions. Consequently, the sense of urgency for technological innovation to reach the ambitious goals is growing, however, it seems that the developments in energy, clean production and other sustainable technologies are still far away from what is needed to get there (DNB, 2018).

1.2 THE ROLE OF STARTUPS AND INVESTORS FOR TECHNOLOGICAL INNOVATION

Today's global challenges - ranging from climate change mitigation and adaptation to increased health and well-being for all - all share that technology plays a fundamental role in their resolution. In situations that need radical innovative solutions often the transition from an idea to a viable business plan – and its implementation - is challenging. It involves high risks, unexplored business models, and an entrepreneurial mindset, typical features that do not come naturally to traditional market players. Instead, new young companies – startups – take up that challenge of innovating incumbent markets because they do have the essential characteristics that helps them cope with these uncertainties. Consequently, when the ambition is to increase sustainable technological innovation to reach the global sustainable development goals, it is essential to eliminate any disruptions that sustainable tech startups might encounter on their way to success.

The fact that startups fit better in the role of innovating markets, does not mean that they are free of any troubles on their way to the market entry of their solution. A tech startup usually has the same starting point: a patented technology invented in a university or (corporate) research institution, that has the potential for a viable market solution. As a start-up typically has no company legacy thus financial liquidity, the first phase of its existence is dedicated to find investors that believe enough in their plans to make a capital injection (Castellas & Ormiston, 2018). These investments happen under high-risk circumstances given the fact that there is no track record of the technology in the market at that stage. For this specific level of risk, the main type of investor that gets involved is the VC investor (Bocken, 2015a).

If the ambition is to redirect all focus from technology-based startups to bringing sustainable solutions, it is clear their financing partners should be shifting perspective as well. Unfortunately, it seems that the financial players in the startup ecosystem have not yet adopted a fully sustainable investment focus (GIIN, 2018). To make a substantial impact with technological innovation, it is crucial to move away from incidental investments in sustainable technology, towards a more systematic understanding of investment in the sustainable tech sector. As an indicator: the SDGs require an estimated US\$1.4 trillion to reach full implementation. This is not expected to be reached by philanthropic or governmental investments, but for at least half of it relies on private sector investments (Castellas & Ormiston, 2018). To this end, the SDGs specifically mentions the mainstreaming of sustainability and sustainable development in companies, most clearly identifiable in goal '12.6 *Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle*' (Inter-Agency and Expert Group on Sustainable Development Goal Indicators, 2016).

When investors do invest their money for reasons beyond financial motives, it is called an 'impact investment'. This thesis challenges the stance of impact investment as a subset of the investment industry (GIIN, 2018), instead it is considered a transitional movement. It should not be the goal to increase the amount of so-called impact investors, but merely to transition the entire VC market into a new way of thinking that includes social and environmental impact as an essential element for your economic decision as a default. This is important, because it implicates to not only increase the opportunities for sustainable finance, but to decrease any financial streams to non-sustainable industries. The Global Impact Investing Network describes this as the objective to gain feasibility at scale for impact investment:

'... As the market grows, it [impact investment] must demonstrate its effectiveness on an ever-increasing scale, in terms of both progress against social and environmental challenges and the ability to generate financial returns to satisfy investors across the risk–return spectrum. Failure to do the former will turn the term 'impact' into little more than a marketing gimmick, while failure to do the latter will confine impact investing to a niche market that falls short of driving the positive impacts on the world that it must.' (GIIN, 2018, p. 38)

1.3 RESEARCH QUESTION

However, operating as a pioneer in a market that is only in the beginning of a transition towards this new mindset of sustainable technology and business, it is sometimes difficult for startups to level with investors and vice versa. VC investors have a traditional financial focus and if they include Environment, Social and Governance (ESG) factors or any impact measurement, it is on the lowkey, non-integrated level (GIIN, 2018). The VCs operate in a larger capitalistic financial system that has not yet found a way to integrate non-financial impact in a proper way. There is a clear value gap between the risks and costs that are associated with investing in sustainability, and the positive impact and future market opportunities that sustainability can bring (DNB, 2018). It seems difficult to appeal to investors with a story that is part state-of-the-art-technology and part sustainability, when the investor might devalue your story by the complexity that sustainability as a business topic brings.

On the other side of the investment process, tech startups spend substantial time to build up a business case and communicate this to investors to raise venture capital. Therefore, it is crucial to understand if and how investors prioritize the sustainability aspect of a business when making the investment decision. There is a lack of information on how investors relate to sustainability, both for 'impact investors' and for investors in general. If we can better understand what the perspectives of sustainable investments are, we can help investors and

tech startups to more effective collaboration, resulting in the much-needed market implementation of technical solutions in the fight against climate change and other social and environmental pressures as defined by the UN SDGs.

This research intends to learn more on the current state of sustainability integration in VC investments in the deep tech sector, and in what direction this is going. To this end, the goal is to understand the perspectives that VC funds hold on sustainable investment strategies, and the reasons behind this. Specifically, the way investors understand 'sustainability' and translate this dimension to their business operations is of interest, as well as the arguments that investors use to – or not to – invest in sustainable tech startups. This study is interested in enhancing investments in startups that bring an innovative technology to the market, delivered in a solution that addresses one or multiple SDG(s). This will address research gaps in the green research & development, entrepreneurship, and investment literature.

To realize the research objective, this thesis intends to answer the following research question:

What is the position and trajectory of sustainability in venture capital funds in the deep tech industry?

This is obtained through answering the following analytical questions:

What sustainable investment transition can be expected from literature?

What factors influence the position and trajectory of sustainability integration by VC funds in the deep tech industry?

How does the theorized sustainable investment transition manifest in deep tech VC funds?

What is the relative importance of sustainability in the investment process for VC investors?

How have deep tech VCs materialized their sustainability ambitions?

1.4 SCIENTIFIC RELEVANCE

According to Talan & Sharma (2019) the core topic of mainstreaming sustainable investment has been under-explored so far, as they indicate a research gap concerning the barriers that stops sustainable investment from becoming mainstream.

In addition, the combination of sustainable investments and tech innovation remains under-explored in literature. Previous research within this area mainly covers private investors in funds and focuses on cleantech rather than sustainability as a holistic concept (Bjornali & Ellingsen, 2014).

Furthermore, the distinction between investors with a high-risk profile, such as VCs, and investors with a lower risk profile, such as banking companies, is relevant in the process of matching initiatives and capital. This distinction however is scarcely explored in the literature in the context of sustainability. As entrepreneurship is key to environmental and societal challenges, and VC is key to success of startups, sustainable venture capital is a key element in achieving global sustainable development (Bocken, 2015b). In that light it makes sense to position venture capital in global sustainable development.

There are pioneers, so-called impact investors, that specifically focus on investing in sustainable solutions, suggesting the sustainability investment strategy has not turned to mainstream investors yet (Bocken, 2015b). This thesis aims to bridge that gap, which begins with understanding that companies have different ways to bring about sustainability: from being a core business differentiator to adopting a sustainable way of working. Next to that, we need to know how investors prioritize the sustainability aspect of the investment to the financial aspect.

1.5 SOCIETAL RELEVANCE

The obtained knowledge will be translated into practical notions for the training and coaching of sustainable deep tech startups in raising venture capital and to help investors make a next step towards standardizing sustainability in investments processes. Eventually, it is all about increasing the introduction of high desired technological solutions for a.o. energy efficiency and cleaner production, thereby addressing climate change and other environmental and social pressures as defined by the SDGs.

2 THEORY

In this chapter relevant literature around the subject of investing in sustainable technology-based startups is analyzed towards an understanding of existing research. Elementary definitions are explained as a base of understanding the relevance of VC investment for sustainable technology-based startups, and how they fit into the sustainable development system. This is followed by an elaboration of the theoretical models of framing and frame institutionalization patterns, that together with the literature review shape the conceptual model.

2.1 LITERATURE REVIEW

This chapter starts with the introduction of the context of sustainable technological innovation, startups, and VC investment. The literature on this topic help in building the argument towards the research subject: sustainability as influencing factor in decision making by VC investors.

2.1.1 TECHNOLOGICAL INNOVATION FOR SUSTAINABILITY

All over the world technical research is conducted to advance current technologies and bring new applications. When these technologies are used to mitigate climate change or in another manner contribute to a cleaner environment they are called 'clean technologies' or 'cleantech' (Gaddy, Sivaram, Jones, & Wayman, 2017). In some definitions clean-tech only refers to clean technologies related to energy generation, storage, distribution and efficiency, however in this thesis the broader definition is used which includes waste management and pollution in general (Bjornali & Ellingsen, 2014; Gaddy et al., 2017), as this research addresses all technologies addressing any of the sustainable development goals. The cleantech sector has been emerging since the beginning of this century and is gaining more attention since the introduction of the Al Gore documentary 'An Inconvenient Truth' (Gore et al., 2006), followed by the run-up to the 2015 UN Paris Agreement (Gaddy et al., 2017).

Seen as the crucial element towards a greener and fairer economy, policy makers working on policy packages like the Paris Agreement, national climate laws and the EU Green Deal have all put an enormous emphasis on this aspect, next to other mechanisms like social change (e.g. decrease consumption), a new perspective on economic systems (e.g. put value to ecological damage) and promoting greener yet less attractive alternatives (e.g. train instead of plane). Those socio-economic measures require people consciously changing behavior, an incredibly difficult part of change, whereas cleantech often implies solutions that seamlessly integrate and enable current life standards to exist whilst lowering the environmental impact. Although it is naïve to expect that technological solutions alone will be the enabler of a sustainable world, they are a crucial co-creator next to change of policy and economic system and both governments and market stakeholders invest time and money in advancing these innovations (Elkington, 2021).

Cleantech literature focuses on the potential environmental impact of technological innovation (Bjornali & Ellingsen, 2014; Bocken, 2015b), however there is more to sustainability than environmental management only. Social challenges can benefit from technology just as well. This research also includes technologies that bring solutions to societal challenges - or the 'common good' (Kuckertz, Berger, & Gaudig, 2019)- such as poverty, food scarcity, health and wellbeing and illiteracy (Chatzitheodorou, Skouloudis, Evangelinos, & Nikolaou, 2019). Examples range from communication technology enhancing (global) cooperation, technologies that improve healthcare and well-being and innovations that help in the

emancipation of different communities worldwide. As this thesis is interested in advancing any of the strategic areas of the Sustainable Development Goals, it includes technological innovations with solutions to environmental and societal challenges, forming the category description of 'sustainable technological innovation'(Elkington, 2021).

The application areas for sustainable innovation are rather widespread, this means that the technologies associated range from material sciences to bio sciences and from mechanical engineering to research in physics - and more. The distinctive factor in this thesis is the fact that they are categorized as 'deep tech' solutions. BCG and deep tech community Hello Tomorrow define deep tech 'as disruptive solutions built around unique, protected or hard-to-reproduce technological or scientific advances (De la Tour, Soussan, Harlé, Chevalier, & Duportet, 2017)'. The level of technology has implications to the risks and costs associated with developing and implementing such technologies. Because of the complexity of deep-tech solutions, they often have a higher risk of failing and higher costs in early development stages, than solutions that have no or low complex technology dependence (such as digital innovation) (DNB, n.d.; Gaddy et al., 2017). In addition, there is a market risk associated with disruptive innovation, since the innovative solutions have no or limited track record (DNB, n.d.).

Sustainable technological innovations are disruptive and unique technological or scientific advances applied to environmental or societal challenges.

2.1.2 SUSTAINABLE STARTUPS & ENTREPRENEURSHIP

Studies have shown that when in need of radical innovation to change an entire industry, the practice of entrepreneurship is crucial. The risky nature of new technology development makes incumbent companies often leave the development to young, entrepreneurial companies, also known as startups (Bjornali & Ellingsen, 2014; Dean & McMullen, 2007; Hockerts & Wüstenhagen, 2010). First, this is because startups are (much) more agile. Second, there is no company legacy to take into consideration when developing their business. Third, startups have less stakes to lose when taking risks in comparison to incumbent companies (Dean & McMullen, 2007; York & Venkataraman, 2010).

Entrepreneurship is seen as an adequate response to market failures, and when environmental degradation and social injustice are considered a market failure, 'sustainable entrepreneurship' should be seen as the right way to respond (Dean & McMullen, 2007).

Fundamental to the progression and successful implementation of startups is external collaboration with industry partners and investors. Especially startups that build their case around complex technology need support that gets them through the costly and often lengthy development phase. A large part of a startups effort in this early phase is therefore aimed towards getting external capital injections, aligning their current capabilities, future visions and needs.

Entrepreneurship manifested through startups is vital for the implementation of disruptive sustainable technology.

2.1.3 VENTURE CAPITAL

As startup development is dependent on capital injections from external investors, it is important to understand the role and behavior of investors in the field of early-stage business development. There are different sources of funding a company can turn to, all based on different conditions concerning the development stage of the company, return of investment strategies and -timing and investor involvement. For startups, investors that are interested in seed, early and scale-up stages are of interest (Bocken, 2015b). A survey amongst 400

technology startups conducted by Boston Consulting Group and Hello Tomorrow suggests that startups turn to family and personal resources in the first stage of their startup. In the second stage they prefer professional funders such as business angels, VC funds and public funds as a resource partner (De la Tour et al., 2017).

For this research we are interested in the venture capital investment model because it is mostly associated with entrepreneurial finance (Tykvová, 2018). Venture capital, a form of equity financing, has particularly played a key role in promoting radical innovations worldwide (Nanda & Rhodes-Kropf, 2013). It is a replacement of traditional bank financing for 'young companies with innovation and growth potential but untested business models and no track record.' (Marcus, Malen, & Ellis, 2013; OECD, 2021) OECD statistics (2021) show a rise in VC investments over the past 15 years. Israel and the United States are obvious frontrunners with VC investments representing 0,35% of GDP, compared to an average of 0,05% of GDP for other OECD countries. To illustrate, the VC market value of the OECD countries has risen from 49,7 bln USD in 2007 to 155,9 bln USD in 2018¹. Recently, Dealroom (2021) studied the deep tech investment scene in Europe and concluded that in the Netherlands between 2015 and 2020 19% of invested VC money went to deep tech innovations, a total of 1.2 billion euros (Dealroom, Sifted, & European Startups, 2021). Regional deep tech clusters they consider are Eindhoven/Brainport-ASML-NXP-Philips, Delft, Wageningen, TNO, University of Amsterdam and Twente. Dealroom currently lists 538 VCs in the Netherlands, of which 78 have 'deep tech', 'high tech' or 'hardware' as linked keyword.

Radical innovation, such as cleantech solutions, often involves different risk factors (see paragraph 2.1.1) which makes their development and market acceptance very uncertain. In consequence, financing radical innovation more often is about dealing with failure than success. The VC model is designed in such a way that extreme failures and extreme successes go hand in hand, allowing investments in very uncertain prospects (Nanda & Rhodes-Kropf, 2013).

A VC fund is the mediating party between two other participants: the entrepreneur and the investor (Silveira & Wright, 2016) (see figure 1). The general mission of a VC is to bring financial resources to entrepreneurs with ideas and to bring ideas to investors with financial resources. The cycle of a VC fund starts with organizing financial input from different investors (individuals, companies, other funds) into one combined fund. The management will now shift its efforts to scouting for startups that are considered a match for the fund. The fund will invest in different projects with a strong growth potential, spreading its

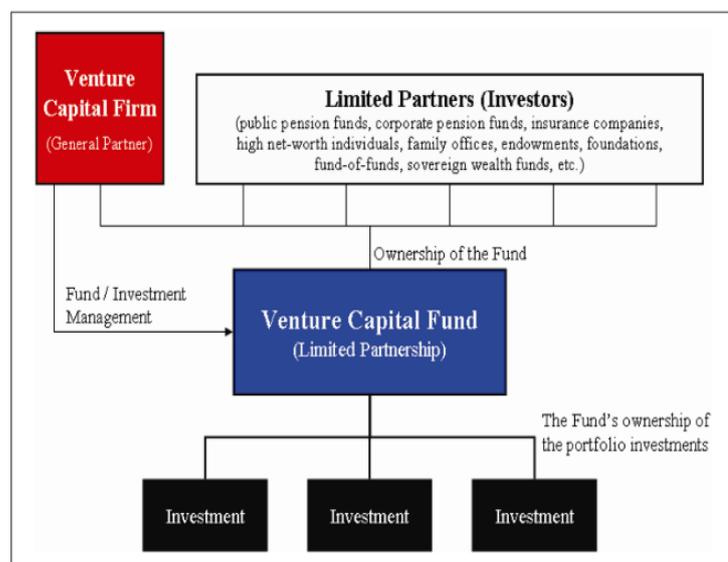


FIGURE 1 A TYPICAL VC FUND ORGANIZATIONAL STRUCTURE

¹ OECD countries, including non-OECD economies Bulgaria, South Africa, Russia and Romania, not including Israel in 2018 numbers

chances. In the implementation phase it is quite usual for a VC fund to stay close to the invested startup, advising its management. A VC fund cycle lasts up to 10 years, after which the balance is made up between projects that failed and projects that have been able to make an exit², providing a return on investment (ROI) for the VC fund and its investors. A VC fund will payout gains to the investors and typically use parts of its own gains to start raising a new fund, thus continuing the VC cycle (Silveira & Wright, 2016).

Because of the high risk and potentially high return analysis the funds need to have a deep understanding about the markets and technologies of the startups. To this end, a VC fund has an investment focus or theme to build up their portfolio, which is also known as the investment thesis (Bocken, 2015a). This can be a market they operate in, such as renewable energy, or a specific technological background, such as advanced materials. Relying on this in-house specific knowledge domains, the fund management team typically have backgrounds that reflect these markets or technologies. In addition, the VC management team has an expertise in implementation of projects, and in this way support and coach their invested startups in an active partnership (Silveira & Wright, 2016).

To a startup, the VC fund provides capital and expertise, but towards their limited partners (LPs) the responsibility of profit maximization is prioritized. The LPs expectations differ, but in general they invest in these funds for the relatively high expected ROI. A pension fund for example, has the responsibility to its member clients to increase financial value, which is translated in their expectation management towards the VC fund management.

Deep tech VC funds enable disruptive startups in the first phases of their business and technology development through equity-based capital injections and business coaching, whilst maximizing profits for their limited partners.

2.1.4 SUSTAINABLE INVESTMENT

This subchapter investigates literature that have tried to understand in what way investors have included sustainability in the past.

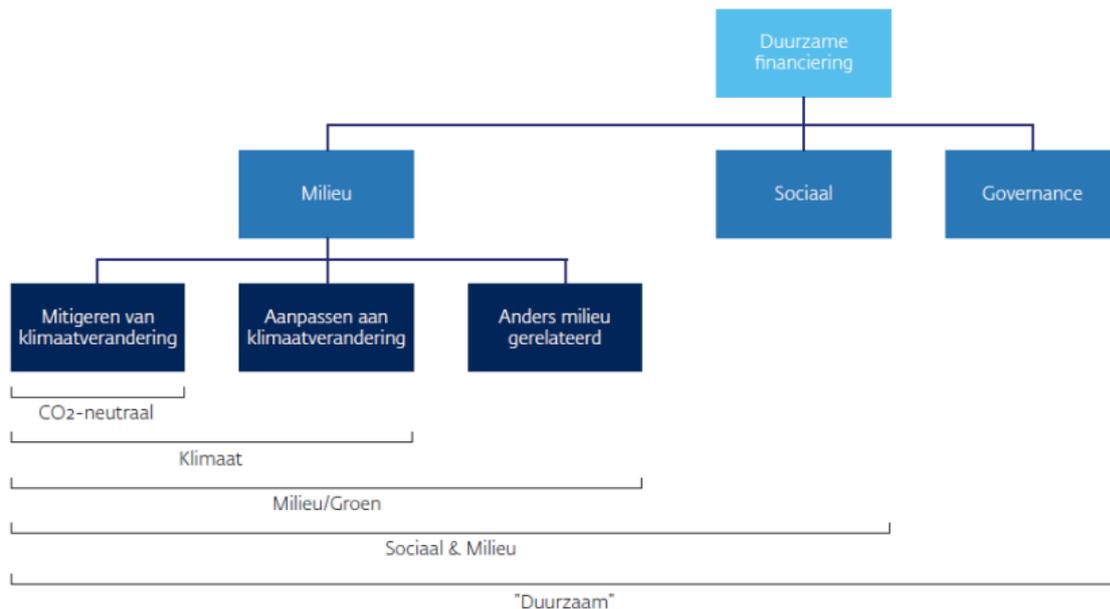
What beforehand complicates this topic, is that there are different ways to refer to investment with social impact, e.g. impact investing, responsible investment, sustainable investment, socially responsible investment. There is no standardized definition of when investments fit into the sustainable investment category (DNB, n.d.). Although most private investors have no clear idea on what 'responsible investment' means (Auer & Schuhmacher, 2016), there are two generally accepted, different approaches to responsible investment in established companies (Chatzitheodorou et al., 2019; Gutsche & Ziegler, 2019):

- Negative screening: an avoiding method in which the investor will avoid industries like tobacco and arms.
- Best in class screening: a method in which best in class on socially or environmentally responsible businesses are selected.

However, there is more to sustainable investing than the opt for exclusion and inclusion of specific sectors or solutions based on their impact. DNB (2018) classifies sustainable investments in three ways: the theme of the investment (1), the degree of sustainability of project/startup (2) and the degree of sustainability in investment procedures (3). The theme of

² When a company goes public (IPO, exit to stock market) or through merger or acquisition by another company, turning equity into money value.

the investment refers to environment, social or governance. Figure 2 shows a visual representation of the themes, also indicating a categorization in environmental related themes (DNB, n.d.).



BRON: UNEP, DNB

FIGURE 2 RESPONSIBLE INVESTMENT CATEGORIZATION BY DNB IN DUTCH

The degree of sustainability in the project refers to the extent to which the invested company integrates sustainability. DNB (2018) concludes that there is no such thing as a sustainable company and a non-sustainable company, instead a spectrum between climate positive or neutral 'green' and carbon intensive 'brown' exists. This goes for the other sustainable themes as well.

The degree of sustainability as part of the investment decision refers to how institutional investors include sustainability, ranging from limited, active, intensified and integrated. This applies to whether investors only use exclusion methods (negative screening), or also opt for including sustainability ratings or even exclusively invest in companies that have a high sustainability rating (positive or best in class screening) (DNB, n.d.). Important to note is that this is based on institutional funds and is not yet including insights from VC funds.

Chatzitheodorou et al. (2019), have a similar approach in their classification of Socially Responsible Investment in four types³, being: socially oriented investments, environmentally oriented investments, socio-environmental investments and sustainability investments. Below is a list of their different sustainability investment domains and its respective kind of investors (not just VC):

Investments in social domain: focuses on solving social societal problems such as poverty and illiteracy. Smallest research domain (15% of their sample), investors are split up in:

³ This explanation excludes the 'economic' dimension of sustainability, as this factor is seen as standard investment strategy.

- a. idealistic investors: concerned with excluding investments that do not match their values (e.g. ethical investors, religious organizations, charities).
- b. socially opportunistic investors: concerned with exploiting financial opportunities arising from social issues.
- c. socially protected investors: aiming to secure investments that are resilient to social risks because of their CSR strategies.

Investments in the environmental domain: focuses on solving environmental problems such as decreasing biodiversity and global warming, both in a passive and active way.

- a. shareholder activists: concerned with influencing business strategies towards including environmental issues through annual shareholder meetings.
- b. environmentally opportunistic: concerned with exploiting financial opportunities arising from environmental issues.
- c. environmental risk avoider: aiming to secure investments that are resilient to environmental pollution and policy, in order to maintain wealth rather than to protect the natural environment.

Investments in the socio-environmental domain: focuses on companies that deliver solutions to the global social and/or environmental challenges.

- a. collaborative investors: concerned with mitigating environmental problems through collaborations between NGOs and investors, motivated by profit and reputation.
- b. socio-green crowdfunders: concerned with financing innovative environmental management solutions by NGOs, through crowd-funding platforms.
- c. Philanthropic venture capitalists: concerned with following traditional VC strategies to achieve high societal impact through business.

Investments in the sustainability domain: focuses on best-in-class companies as opportunities to increase financial returns. Differentiate in their way of including social, environmental and economic goals simultaneously. Benchmarking through stock exchange sustainability indexes such as Dow Jones.

Following the line of the responsible investment categories of Chatzeridou et al. (2019) and the collective market belief (Dumas & Louche, 2016) it appears that the concepts of what sustainable investing means are in transformation and have yet to get in a shape that is most effective for the advancement of a sustainable society. In 2018, the GIIN (Global Impact Investing Network) published the report 'Roadmap for future of impact investing: reshaping financial markets' in which they consider different action points on that matter stating, *"a coordinated global campaign is needed to fundamentally shift perceptions about the role capital in society ... i.e., by driving the shift toward the integration of impact into investment decision-making becoming the 'new normal'. By inspiring a diverse and far-reaching audience to change its ideas about the role of capital, the campaign will not just drive adoption of impact investing but have an impact on investing practice across financial markets."* (GIIN, 2018, p.47). In support of investors and financial markets, they see a role for academics to research and understand dynamics of sustainability integration and furthermore to develop tools and theories that enhance these sustainable decisions towards becoming mainstream.

This overview reveals different motivations to include sustainability in the investment decision. In the next paragraph this is put in the VC context.

Sustainable investment is found in many shapes and forms but has yet to become the default opt in mainstream investing.

2.1.5 SUSTAINABLE VENTURE CAPITAL

Literature has studied responsible investment in the general investment spectrum but lacks specific insights on the integration of sustainability in VC investment. This paragraph is thus a culmination of existing literature on responsible investment, put in the VC context.

The high risk investment profile of venture capital is specifically relevant in the sustainable investment market, as it seems that the risk-profit profile of sustainable projects is currently the most important reason that broader investment structures such as pension funds and traditional banks find it difficult to engage (DNB, n.d.). Consequentially, the VC model would be an ideal fit for sustainable investment, thus this research is interested in how venture capital could be activated for sustainable technologies. Different insights can be drafted from theory, as will be discussed in the following paragraphs.

Focusing on the types of motivation relevant for sustainable innovation and venture capital, mostly opportunity based, risk avoidance and philanthropic motives stand out. The main antithesis of these worlds is the position of interest of the self: is the investment decision to focus on sustainability based on the premise that it will enhance profit for the fund (self-centered), or is it based on the idea that the fund is in the position to increase the share of sustainable innovation (altruistic, selfless). In other words, there is the perspective of profit making in the world of sustainable innovation and the perspective of enabling sustainable innovation in a for-profit model and it is important to understand how these two perspectives influence the mainstreaming of investing in sustainable innovation.

Another insight from the investor type overview by Chatzitheodorou et al. (2019) and the DNB (2018) report is the degree of sustainability that comes forward in investment strategy of the investing party and the business case of the company. Sustainability apparently manifests in different levels ranging from no specific attention to sustainability at all, to risk avoidance through exclusion methods and regulatory compliance, to resilience to policy change and the risks of social and environmental pressures, to actually achieving societal (social and/or environmental) impact through the invested solutions (Chatzitheodorou et al., 2019; DNB, n.d.).

In relation to that, one might also argue what best-in-class investments mean. The Dutch leader in sustainable banking Triodos states in their impact investing strategy the following about this controversy: *'It is not enough to invest in best-in-class companies which, within their sector, perhaps belong to the least polluting. For a truly sustainable future, we must invest in those companies that actively contribute to a healthy planet and sustainable societies.'* (Triodos Investment Management, 2018, p.3) The concept of 'best-in-class' might be very different in an investment sector that usually invests in innovative companies. Understanding what VC investors mean with 'best-in-class' is important to understand in what direction sustainable investments are going.

This thesis also sees an important role for general market beliefs affecting investor behavior drawing from Dumas & Louche (2016), who studied how collective beliefs of the market in responsible investing (RI) has changed over time and recognized similar distinctions in reasons to or to not engage in responsible investment as Chatzitheodorou et al., (2019). They see a discourse shift from ethics to market logics and towards more professionalization yet

mainstreaming of sustainable finance has not been reached because the ‘collective beliefs’ have not endorsed it so far. Despite expectations that the collective belief of the market is the sum of all individual beliefs, it is self-referential and autonomous. This is important, because it implies that the individual belief shapes and legitimizes the market yet the market belief also shapes and legitimizes the individual belief (Dumas & Louche, 2016). Especially in an investment sector that is usually active in new markets, this might have influence on the decision making.

The innovative and high-risk context of sustainable venture capital influences the way sustainability is perceived.

2.2 THEORETICAL FRAMEWORK

Literature on investment by VC funds in sustainable technology has been used to define the context of this research. In the following part, the base for a conceptual framework is formed around the social constructionist theory of interactional framing. First, framing as a social theory will be explained. This is followed by an introduction of the theoretical model by Gray, Purdy & Ansari (2015) who relate institutionalization theory and micro-framing in their theory.

2.2.1 FRAMING AND FRAME ANALYSIS

In the mid-eighties, Goffman (1974) introduced a new view on how individuals - but also groups and society as a whole - organize experiences. He describes how we qualify empirical behavior by distinguishing between schematic opposites, such as here-there or safe-dangerous. This helps us, individually and collectively, in organizing the numerous incoherent experiences we encounter. Framing is a constant, often subconscious, behavior that allows us to position ourselves in our individually or collectively assembled idea of the world and moral order. We construct reality through frames ourselves, but we also get presented with normative frames from a young age. With stories and fairy tales as a vehicle, the world around us is framed to make sense of it. Frames in a sense influence frames. (Goffman, 1974) Later, the efforts of Snow et al. (1986) turned Framing into an important theoretical paradigm with many implications on how to understand social movements by ‘analyzing frame alignment as a conceptual bridge linking social psychological and resource mobilization views on movement participation.’ (Snow et al., 1986, p. 464)

Frames should not be seen as direct representations of reality like pictures, but instead frames include certain perspectives towards that reality. That does not mean they are useless; they actually do have a self-fulfilling role. About this, William Thomas (1928) said *“If men define situations as real, they are real in their consequences.”* However, frames are not ‘socially neutral’ (Leroy, lecture 6 E&S, 2017), they have social consequences as they guide behavior, choices, and preferences, thereby pre-selecting policies which in turn might reproduce frames.

2.2.2 FRAME BUILDING AND SHIFTING

To discover to what extent the frame of investing for sustainable innovations has been adopted throughout the field of VC funds, for this study a particularly relevant characteristic of frames is the fact that they have the potential to interact on different levels (Cornelissen & Werner, 2014). Gray, Purdy & Ansari (2015) have theorized a model of interactional framing that elaborates on that link between bottom-up micro-level framing practices and the macro-level institutionalization of frames. Institutionalization refers to the situation when a frame has reached status quo or taken for granted status. In the following paragraphs the theory will be explained and applied to the context of deep tech VC funds.

Gray, Purdy & Ansari (2015) start with the insight that the process of institutionalization is socially constructed yet at the same time *'maintained in a politicized social environment by interactants of varied power acting within and outside the field.'* (p. 118) As sustainability can be seen as a dynamic globally contextualized concept, frames that include the concept of sustainability will be both influenced by outside perspective and top-down existing frames on sustainability, whilst being under pressure from bottom-up social construction of that frame. Thus, the concept of framing and institutionalization of frames is bidirectional (Gray, Purdy, & Ansari, 2015) and studying this requires including micro-framing processes from bottom-up perspective and top-down processes of legitimacy and power relations.

2.2.3 BOTTOM-UP: INSTITUTIONAL MECHANISMS

For the micro-framing processes Gray, Purdy & Ansari (2015) draw upon interactional framing theory that *'assumes that frames (and institutions) are being constructed, deconstructed, and reconstructed as individuals engage with one another in everyday interactions.'* (p.118) Meaning therefor resides in the social and not individual, and following Gray, Purdy & Ansari (2015) in this research this part of the interaction will be referred to as interactants⁴. When interactants are consistent and repetitive in their interaction on frames *'and act on them as if they existed independently, institutionalization occurs.'* (p. 119)

In reality, frames are not always perfectly reproduced, and these misfirings are just the reason why institutional change might happen. Gray, Purdy & Ansari (2015) point out three processes that cause a lamination of frames, as Goffman (1974) named the *'process of responding to another's frame and adding a new interpretation on top of the other's'* (p.120). The first is **keying**, which is when *'a variation of an original frame is offered with a subtle shift in meaning'* (p.129). The perceived activity does not change, but the dominating norms are interrupted and will prompt a change in response. The second lamination process is a **frame break**, which is when interactants *'intentionally break the frame because they conclude it is untenable as an interpretation in the given circumstances.'* The third lamination process is **ambiguity**, which is when two interactants might perceive a situation differently without trying to change the other interactant's frame.

Through these micro-level interactions new frames are produced, which in turn might be subject to so-called amplification processes, which is when the micro-level frame becomes the new status quo, or in other words to be institutionalized on the macro-level and replace incumbent frames (Gray et al., 2015). Gray, Purdy & Ansari (2015) point out three amplification processes. The first is **scope expansion** through diffusion of a frame over different networks, eventually causing meanings to be spread out to other interactants. Second is the increasing of **regularity or frequency**, which is when the endurance of a frame is expanded through repetition, for example through the implementation of rituals. Third is the process of **emotional intensification**, which is when identification with a frame is intensified through emotional connection. Spillover is key in this process, as *'individuals import emotional residue from previous encounters into new ones.'* (p.123)

The real value of the theory by Gray, Purdy & Ansari (2015) comes when they combine the insights on frame lamination and amplification processes in a set of patterns towards institutional change, or persistence for that matter. By connecting these framing micro-processes, the researchers create four patterns and according frame institutionalization mechanisms, or framing mechanisms (Gray et al., 2015). In brief description they are:

⁴ Interactants can be an individual, an organization, a group or even a country.

- A. Frame break and amplification of a new frame, through
 - External reframing: pressure such as exogenous events or powerful interactants cause for adoption of new frame, the adoption itself is an amplification strategy.
 - Internal reframing: when interactants in a field or organization exploit their dissatisfaction with the status quo and create a new frame.
 - Importing a master frame: when a strong and widely known (institutionalized) social movement frame is imported to field to replace the incumbent frame.
- B. Amplification of existing frame
 - Maintaining frame dominance: through reinforcement of existing frame
 - Institutional distancing: when interactants produce a symbolic compliance to external expectations, while practically applying their own frame implications. This way the interactant attempts *'to avoid conformance to normative pressures by insulating themselves from the dominant frame in the field'* (p.129)
- C. Keying and amplification of modified frame
 - Merging frames: multiple interactants combine existing frames into one frame that can replace the original ones.
 - Situated improvising: the gradual process of changing and adopting a frame, induced through practical insights.
- D. Ambiguity and inconsistent amplification
 - Maintaining frame plurality: can exist if interactants tolerate the existence of multiple frames in a field.

2.2.4 TOP-DOWN: FIELD CONDITIONS

This way, the frame institutionalization patterns have been subject only to micro-level framing processes, so to make the patterns theoretically representative Gray, Purdy & Ansari (2015) make a final iteration in which they add field conditions, also known as structuration processes. These field conditions are important, because true to constructionist theory *'In any given interaction, whether interactants take steps to maintain or change a field will be influenced by the legitimation norms and level of domination they perceive to exist within it.'* (p.131)

First, the field is subject to legitimacy, because *'in weighing whether they can **maintain** or **change** the legitimacy standards in a field, interactants are either enabled or constrained by the rules and roles of the extant normative order instantiated in their interactions.'* (p.131) It is important to understand whether an interactant is operating against or in alignment with current field normative standards.

Second is the role that power relations play, as they might promote or block certain framing practices, and influence whether a situation appears possible or impossible to change. Two power practices can be identified. First is **systemic power**, known for domination, rules, regulation and covered inequity. The second is **episodic power**, that is considered more diffused and less constrained by rules, allowing for openings to maneuver. Exploring the perceived power relations of a field helps in understanding the level of freedom an interactant might feel in reframing.

2.2.5 FRAME INSTITUTIONALIZATION PATTERNS

Finally, figure 3 shows a matrix that positions the bottom-up framing mechanisms in the top-down field structures, and presents four frame institutionalization patterns: maintaining **status quo**, **revolution**, **evolution** and **power sharing**.

Figure 4 illustrates the frame institutionalization process, which for this research takes place on organizational level. Bottom-up processes relate to employee and organizational framing processes, and top-down processes relate to the impact of market and society on that frame institutionalization process. Analyzing these characteristics in deep tech VC funds will give the input to place VC investors on the matrix and understand what the current position of the sustainable investment frame is.

		Domination: Perception of power relations	
		Systemic	Episodic
Legitimation: Stance toward field norms	Change	Pattern A—Revolution Externally induced reframing <i>Focal interactant promotes new frame imposed on focal field</i> Internal reframing <i>Focal interactant promotes revising frame of focal field</i> Importing a master frame <i>Focal interactant promotes higher-order frame in focal field</i>	Pattern C—Evolution Merging frames <i>Focal interactant participates in constructing a new frame in the focal field from existing ones</i> Situated improvising <i>Focal interactant gradually creates new frame in the focal field</i>
	Maintain	Pattern B—Status quo Maintaining frame dominance <i>Focal interactant reinforces existing frame for focal field</i> Institutional distancing <i>Focal interactant insulates itself from existing frame of focal field</i>	Pattern D—Power sharing Maintaining frame plurality <i>Focal interactant supports coexistence of multiple frames in the focal field</i>

FIGURE 3 STRUCTURATION PROCESSES, INSTITUTIONAL MECHANISMS AND FRAME INSTITUTIONALIZATION PATTERNS BY GRAY, PURDY AND ANSARI (2015)

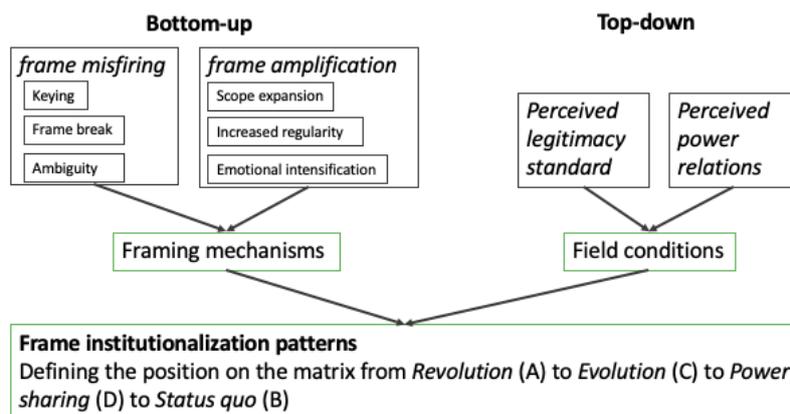


FIGURE 4 THE PROCESS OF FRAME INSTUTIONALIZATION

2.3 INSTITUTIONALIZATION OF THE SUSTAINABLE INVESTMENT FRAME FOR DEEP TECH VENTURE CAPITAL

This research intends to understand the current position of sustainability in deep tech VC funds, through identifying the institutional mechanisms that persevere or change the institutional frame on sustainability in the field. This concerns the transformation process between two opposite ends: traditional VC investment frame and sustainability integration in VC frame. To guide this process, it is important to understand what current dominant patterns in the field exist. Before studying frame institutionalization patterns, based on the field conditions and framing micro-processes, in the empirical part of this research, dominant frame institutionalization patterns are elaborated upon using existing studies on sustainable

investment as studied in chapter 2.1. In figure 5 the frame institutionalization patterns found in theory and their respective effect on the mainstreaming of the sustainable investment frame is conceptualized.

The following paragraph consists of a frame institutionalization pattern analysis based on that literature review. It is a concise frame analysis, because this allows for elaboration through empirical research and theory does not have precise input for the context of deep tech startup investments and sustainability. The analysis includes a hypothesis of what institutionalization pattern can be expected, thus answering the first research question ‘*What sustainable investment transition can be expected from literature?*’ Finally, this theoretical frame analysis will be concluded in a conceptual model that serves as a foundation for the empirical part of this research.

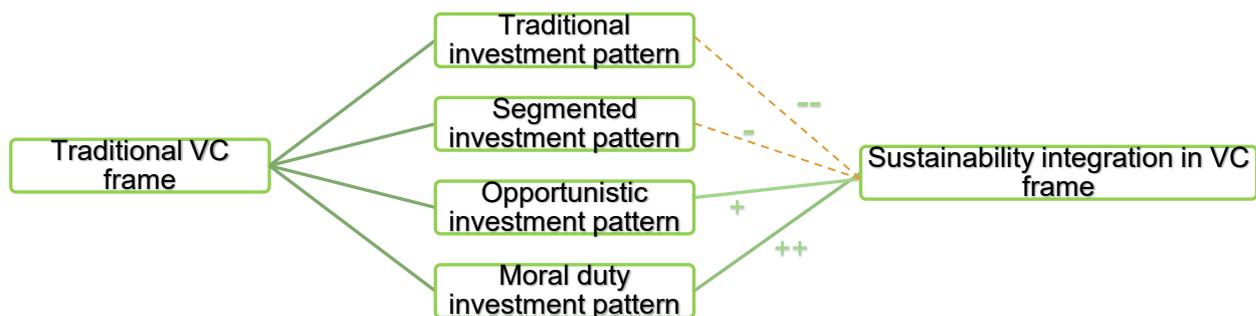


FIGURE 5 FRAME INSTITUTIONALIZATION PATTERNS RELATED TO MAINSTREAMING OF THE SUSTAINABILITY FRAME

2.3.1 TRADITIONAL INVESTMENT ‘STATUS QUO’ PATTERN

In this pattern, sustainability does not have a positive connotation, as investors in this realm see no direct financial reflection of potential negative externalities that companies might have. The frame is built on classic VC investment theses like shorttermism, profit maximization and competitiveness. These characteristics are considered sufficient for investment decision making and create a market that is most beneficial for society.

Although one cannot deny the VC market has been seeing a rise in so-called impact investors, for the traditional investment frame these investors will be considered philanthropic based with no financial goal and as such not a real part of the VC spectrum. The general VC reality is that this is a fully economic model, meaning that all business decisions are based on economic motives and its responsibilities are purely financial and opportunity based, whichever that might be (Silveira & Wright, 2016). The economic model at this point simply only suffices for profit maximization (Phillips, 2018). Startups are valued on their innovativeness and potential market value, and the timeframe of financial growth. This passive approach is also causing a misinterpretation of the potential value of sustainable innovations as well as the potential costs of investing non-sustainable innovations (DNB, n.d.).

In this frame sustainability and sustainable choices are not seen as the responsibility of the market and VC funds specifically, rather that responsibility should be induced from governmental regulation. In this position it is indeed consumer demand and governmental regulation that could motivate choices linked to sustainable investments, but not because they

are sustainable as such. Powerful financial institutions and governments define that investments should be regarded as financial decisions only.

This dominant frame can also directly be linked to the corresponding institutionalization pattern 'status quo', as they want to maintain traditional economic model and are subject to systemic power in the form of incumbent rules and regulation through that economic system. However, deep-tech VC investors have high interest in technology advancement and are confronted with state-of-the-art technologies on daily base, which originate from research centers and universities who in general have societal commitment. Add to this the larger societal pressure to markets to get involved in sustainable development, which by no means can be ignored, and the expectation is that for deep-tech VC funds operating on the status quo frame, the institutionalization mechanism of 'institutional distancing' is in play. Still, the possibility exists that VC funds consciously seek compliance with existing norms and try to actively maintain frame dominance. This pattern has a negative influence on the mainstreaming of the sustainable investment frame.

2.3.2 SEGMENTED INVESTMENT 'POWER SHARING' PATTERN

In a variation to the traditional investment pattern there is the perception of a segmentation of the market, where sustainable investment thesis is a choice that can exist next to the traditional investment thesis. In this frame the potential effects of environmental and social pressures to society and the market is not set in stone and considering sustainability as an opportunity or a threat is perceived as an option, and all classic economic motives are seen as barriers to include that option (Paetzold & Busch, 2014). From theory one might expect the segmented investment pattern is still the most dominant in the VC market.

In the segmented investment pattern, VC investors do not see a direct link between sustainability and social and environmental pressures to their investments. Although the role for market players in the quest to sustainable development and sustainability is gaining traction, a recognition of responsibility has not yet been established in all VC funds. Uncertainty on what the future of sustainable investment holds and a lack of external pressure to align, causes a range of frames to exist next to each other and field legitimacy is maintained. This results in the idea that sustainable investment is a choice of market, affecting only the investment thesis, as it does for example for Impact Investors. Power in the market is considered episodic, as VCs have autonomy to choose their investment thesis and investment selection methods.

In this pattern, there is no pathway towards mainstreaming the sustainable investment because the traditional financial focused VC practices are not questioned. Similar to the status quo pattern, in the best-case scenario the pathway is induced through passive acceptance of regulatory change. As such, this frame institutionalization pattern has a negative influence on the mainstreaming of the sustainable investment frame, although it does recognize sustainability as a potential factor in the investment decision.

2.3.3 OPPORTUNISTIC 'EVOLUTION' PATTERN

The investors that do observe sustainability is affecting their business, have two different positions as well. First, there is the belief that businesses have a responsibility to eliminate or reduce environmental and social risks of their practices, which can be seen as a semi-economic vision, from now on called the 'opportunistic frame' (Chatzitheodorou et al., 2019). Different from the status quo frame is that these investors do not question the existence of a threat to market and society opposed by societal challenges. In this position you could say still there is a centralized financial duty, and to this end the opportunities and challenges that are

linked to sustainability are recognized and acted upon. Business resilience and exploiting entrepreneurial opportunities from environmental- or social pressures are the main reason to consider sustainability in decision making (Chatzitheodorou et al., 2019).

The opportunistic frame is based on the legitimization of sustainable investments, but in a non-exclusive manner (DNB, n.d.). Deep tech solutions are typically prone to have a high environmental pressure in its production, as well as social pressures throughout the supply chain. In response, deep tech investors that want to increase environmental and social resilience will need to have special attention to the company's impact profile. This is mostly induced by anticipated regulatory change, but also through the anticipated effects of environmental and social pressures on the investments. For example, climate change might change markets in the foreseeable future, and this affects the industries that VCs might invest in.

Because sustainability can manifest through both the business processes and the potential societal impact of the core activity, the degree of sustainability can differentiate per investment (DNB, n.d.). In this pattern the aim is not necessarily to reach highest degree of sustainability in companies and investments, but to mitigate related risks through reaching a certain degree of sustainability. This often requires, though moderate, an active approach in integrating ESG factors. However, through opportunity seeking, a higher degree of sustainability can be included: beyond the optimal social and environmental impact of the company, the solution or core activity than has a societal impact in itself, for example through compliance to the SDGs (DNB, n.d.)

This frame can be related to the frame institutionalization pattern of 'evolution', because of the way investors try to combine the frame of profit maximization and sustainable impact. They do not reject the financial system, however, do seek to change norms of what is good investment and adopt investment analysis methods beyond financial performance by using the beneficiary elements of the traditional economic and financial system. It is giving new meanings to existing field practices. The interactants in this frame perceive a dominant power structure of traditional investing, because they are trying to change the entire perception of what is a good investment, however through the pioneering role that VC investors have, the market is somewhat separated from the traditional economic system, making that *'the field is fluid enough to permit variations in framing through keyings.'* (Gray et al., 2015, p.132)

Next to the merging frames mechanism, the situational improvising mechanism is identifiable, as investment decisions are inherently linked to new insights that might change a frame such as regulatory change, emerging technologies and markets.

2.3.4 MORAL DUTY 'REVOLUTION' PATTERN

The third pattern that can be extracted is the sense of moral duty towards sustainability in investment and economy as a whole. This frame sees a responsibility for the traditional VC tools such as capital injection and scalability to be used to address large societal problems. In this frame sustainability is no longer seen as an opportunity or the need to build business resilience, but rather the non-inclusion of sustainable practices is seen as a threat to society and market. The moral duty frame combines the idea that a VC fund is ethically responsible to invest in sustainable innovations, e.g. solutions to the SDGs, and at the same time needs to avoid non-sustainable innovations.

This frame fully adopts macro social frames on sustainable development and shared responsibility. In the deep tech scene, this frame is breaking with a focus on technological advancement without ESG limitations and with the profit maximization frame that seeks economic opportunity. In this frame, not only the investment thesis is transformed to social

impact context, also the way of conducting business is challenged. Profit maximization is replaced for the process of profit satisficing, which makes that the frame is seeking to change the field legitimacy with regards to profit maximization. The pricing of social and environmental externalities could be another way to rethink the traditional economic focus.

Field legitimacy is challenged in all possible ways, as interactants recognize that the current economic and financial system that they are operating in, does not serve a sustainable and fair society. The financially framed risk-return model no longer supports an investment analysis that should be sustainable and future proof and harms environment and society. Interactants seek to change the entire financial and economic system into one that is based around sustainable development, and where VCs play an innovation enabling and society serving role. This all while being constraint by powerful financial institutes and governments that enforce a traditional and conservative financial risk-return frame on what makes a successful and meaningful investment.

As such, the primary type of lamination is frame break, by actively questioning the legitimacy of VC investing and its role. The expectation is that this can happen through any of the three related framing mechanisms. First is externally induced reframing, e.g. when an investing partner forces the integration of sustainability in startup selection, or when societal pressure on sustainable business choices breaks the extant frame of profit focused VCs. It can happen through the mechanism of internal reframing, which is when the interactant exploits tensions between practice and expectations within a field. Next to that, the mechanism of importing a master frame such as the Sustainable Development Goals, social justice or the risks of climate change can be extracted from theory.

2.3.5 CONCLUSION OF THEORY

The dominant frame institutionalization patterns on moving away from the status quo frame towards the integrated sustainability frame in the deep tech VC field have been interpreted from theory and put in relation to the institutional mechanisms of Gray, Purdy & Ansari (2015). In this conclusive paragraph, these insights will be transformed into a conceptualization that allows an empirical research of deep tech VCs and their processes of framing sustainability.

Figure 6 and 7 consist of a conceptualization of the different patterns of institutionalization. Table 6 represent the frame processes that are expected to induce a reframing towards sustainable investment. Table 7 represent the frame processes that are expected to have a negative influence on the integration of sustainable investment. In this conceptualization the interactional framing model by (Gray et al., 2015) is applied to the institutionalization of the sustainable investment frame. The different processes have indicators that are used to analyze the empirical data for the case studies in chapter 4.

Framing pattern	A Revolution: Moral duty			C Evolution: Opportunistic	
Perceived power relations	Systemic			Episodic	
Field legitimacy	Change			Change	
Primary type of lamination	Frame break: actively questioning the legitimacy of VC investing and its role.			Keying: VC investing as an activity does not change, but gets different meaning, causing change in behavior.	
Indicators per framing mechanism	<i>Externally induced reframing:</i> Experience	<i>Internal reframing:</i> Exploits institutional	<i>Import a master frame:</i> As part of a	<i>Merging frames:</i> The sustainable impact frame is combined with the traditional	<i>Gradually creates new frame:</i> Investments in sustainable

	external pressure (outside field) that causes a frame break of VC role in sustainable development, such as regulatory change for investments: need alternatives to traditional financial model, such as satisficing	contradictions within established VC frame: it makes no sense to not include sustainability in a business decision as it shapes future markets, and investment decisions nowadays do not support sustainability. Want to reposition the role of VCs.	wider societal transition adopts a higher order, outside the field, frame of SDGs or new economic models such as the doughnut economy to promote responsible investment	finance frame, constructing a frame that has elements of traditional investment and sustainable investment.	technology that have proven successful change perspectives on sustainable investment decisions, experimental
Frame amplification	Promotes new frame through expansion of scope, regularity and emotional intensity.	Promotes revising frame through expansion of regularity and emotional intensity and feels less emotional connection to extant frame.	Promotes higher order frame through expansion of scope, regularity and emotional intensity and feels less emotional connection to extant frame.	Constructs new frame from existing frames through expansion of scope, regularity and emotional intensity of merged frame.	Gradually creates new frame through expansion of scope and regularity of new frame.

FIGURE 6 INDICATORS OF FRAME INSTITUTIONALIZATION PATTERNS OF SUSTAINABILITY INTEGRATION IN DEEP TECH VC FUNDS

Framing pattern	B Status quo: Traditional investment		D Power sharing: Segmented investment
Perceived power relations	Systemic		Episodic
Field legitimacy	Maintain		Maintain
Primary type of lamination	None: extant traditional investment frame remains		Ambiguity: uncertainty about the role of VC in sustainable innovation causes a tolerance of different frames
Indicators per framing mechanism	<i>Reinforce existing frame:</i> Shortermism, profit maximization and competitiveness are key elements to the traditional financial model	<i>Insulate from existing frame:</i> Actively resist the sustainable investment frame because it appears to not align with their ideas of the financial model.	<i>Support coexistence of frames:</i> Recognition that the field is in transition, yet different frames of sustainability in investment exist next to each other and no frame alignment processes occur or if so, it is resisted.

	that needs no revision.		
Frame amplification	Scope of frame does not change; existing frame is promoted through increased emotional intensity and regularity. In addition, the focal interactant could actively shield herself from new frame.		Existing frame is promoted through an increased scope and regularity and emotional intensity can be increased as well as decreased.

FIGURE 7 INDICATORS OF FRAME INSTITUTIONALIZATION PATTERNS OF MAINTAINING FINANCE FOCUS IN DEEP TECH VC FUNDS

2.1 REVISITING THE RESEARCH QUESTION

As this research intends to understand the current position of the sustainable investment frame in the deep tech VC field, these patterns have provided a literature-based answer to the first research question “*What sustainable investment transition can be expected from literature?*” These insights are used to provide a structure to understand what mechanisms of institutional change and perceived field conditions can be identified in the deep tech VC field in terms of the adoption of a sustainability frame. In that light, the research questions as presented in chapter 1.3 will be rephrased with the theorized conceptions in mind:

The main research question:

What frame institutionalization patterns for sustainable investment are prominent in the deep tech venture capital industry?

This is obtained through answering the following analytical questions:

To what extent are traces of the theorized frame institutionalization patterns, by means of field conditions and framing mechanisms, of sustainable investment visible in deep tech focused VCs?

What is the relative importance of these traces in the investment process for VC investors?

How have deep tech VCs materialized their sustainable investment frames i.e. in organizational processes?

3 METHODOLOGY

In this chapter the research methodology is explained and further elaborated. Chapter 3.1 introduces the overall research method. Chapter 3.2 explains the research strategy and in chapter 3.3 data collection and choices in analysis are explained. Finally, in chapter 3.4 the research validity and reliability are discussed.

3.1 RESEARCH PARADIGM

As a researcher, you must acknowledge that different positions exist in understanding the nature of knowledge (epistemology) and the nature of reality (ontology), together shaping your research paradigm. This elaboration on the research epistemology and ontology will form the foundation of this methodology chapter and thesis.

This study combines the understanding of context - sustainability in business - and understanding of behavior - reasons for investing in sustainable deep tech startups. As such, this study is subject to social realities. This viewpoint fits into the epistemology of interpretivism, which is mainly built up from three theoretical perspectives: Weber's *Verstehen*, phenomenology, and symbolic interactionism (Bryman, 2015). In the interpretivist approach, one assumes that - in contrast to natural sciences research objects - human behavior as a research subject is linked to social action and requires considerably different research strategies. Acknowledging social action requires researchers to include various levels of interpretation into the research: describing how members of a social group (in the research context) interpret the world around them, followed by an interpretation of this interpretation by the researcher and finally an interpretation of this interpretation through placing it in the theoretical stance of that research area (Bryman, 2015, p.28). Every interpretative step has an annotation of the social reality that exists.

Although human behavior can be a research subject in the positivist approach, it does not fit the purpose: this study aims to learn mostly from the 'norms, values, and culture of the group or community in question' (Bryman, 2015, p.626) rather than to understand and describe the behavior - investing in sustainable deep tech startups - itself.

When studying behavior in social action, it is important to see the subject in a position - or social reality - that it is always under construction and reconstruction, e.g. in this study financing culture and societies viewpoints on climate action, but also a person's position in that socially constructed reality. One needs to recognize that social objects and categories are socially constructed, an ontological position known as 'constructionism' (Bryman, 2015). A crucial element of this research is the way individuals conceive and construct the concept of sustainability and how it corresponds to a more objective truth. This in itself is an example of constructionism. Both framing and its institutionalization are processes inherently linked to a context. The research therefore emphasizes on the active involvement that the individual investors have in their construct of the concept of sustainability in investment opportunities.

3.2 RESEARCH STRATEGY AND DESIGN

The research question '*What frame institutionalization patterns for sustainable investment are prominent in the deep tech venture capital industry?*' is addressed by a pragmatic combination of inductive and deductive qualitative research methods. The first step was to deductively turn the literature study on sustainable venture capital and deep tech investment into a tangible

framework for analyzing the empirical data, using framing theory as context. This first analytical step is the answer to the first research question, which is why this is only presented after the methodology chapter. What followed was an inductive study of the empirical data using the theorized framework, which is presented as a comparative case-study (Bryman, 2016).

Bryman (2016) argues that having multiple case study is helpful for theory building. As the research is looking for understanding an underexplored topic theoretically and with a base in practice, it benefits from the qualitative multiple case study approach. In addition, presenting the qualitative results in a multiple case-study based on interviews with employees allows for an in depth understanding of how meaning is given towards sustainability in every individual VC. This is important because these VCs all have their own distinguishing characteristics besides the fact that they all operate in the field of deep tech. As the research is looking for signs of mainstreaming of a particular frame, it is important investigate multiple VCs to get an idea of the field level integration and *'in what circumstances a theory will hold or not'* (Bryman, 2016, p. 67). This research includes 5 case studies that serve as an indication of the Dutch, as well as European, deep tech VC sector. These case studies form the input to answer the research questions.

3.3 RESEARCH METHOD

In this paragraph the practical execution of this research is elaborated. The research is executed in two phases. The first part is an explanation on the conceptual model and its place in this research. The second part is the empirical data collection process and analysis method.

3.3.1 THEORY BASED CONCEPTUALIZATION

The literature review was used inductively to theorize a conceptual model which is also part of an answer to the research questions. As it already includes researchers' interpretations the decision is made to include it in the results, although one could argue it would also fit in the theoretical chapter. The result is an elaboration on the expected institutionalization patterns, based on theory. This outline is the base for the interview questions and coding of the empirical data.

3.3.2 DATA COLLECTION

In this comparative case study, deep tech VC funds are the subject. The cases are selected via the purposive sampling method of typical case selection. In this research, this means the cases are selected to (a) represent the research subject that is VC funds with experience in investing in deep tech startups. Furthermore, the final selection of cases is based upon reaching a certain variety in expected sustainability focus⁵. On a more practical notion, the respondents met the following requirements: (b) able to take part in a semi-structured interview and are open to share their methods and thoughts with the researcher and (c) the investors have experience working in the Dutch innovation scene, specifically in the Eindhoven region

⁵ To do this, the selection of the cases was made in a discussion with industry expert Guus Frericks (HighTechXL) who is familiar with the basic orientation of all VC funds.

for the deep tech context⁶. Criterion (b) and (c) exist to make it less complex to find - and communicate with - case subjects.

A total of ten individuals were interviewed. This number is chosen because it is considered a reasonable sample to be studied in a period of a master thesis⁷, and at the same time matching the case selection. Eventually 1-3 interviews were conducted per individual embedded case. Figure 8 shows and oversight of the selected cases and the roles of its according interviewees⁸.

Nr	Embedded case	Role	Date, location
1	Fund 1	General partner	12/11/2020, High Tech Campus 27
2		General partner	25/11/2020, High Tech Campus 27
3		ESG officer	25/11/2020, Zoom call
4	Fund 2	Investment manager	28/1/2021, Whereby call
5		Investment analyst ⁹	1/2/2021, Google Hangout call
6	Brightlands Venture Partners (3)	Investment analyst	18/4/2021, Google Hangout call
7		Partner	4/5/2021, MS Teams call
8	BOM (4)	Business developer HTSM	3/2/2021, Google Hangout call
9		Investment Manager Soft Tech	16/2/2021, Google Hangout call
10	HighTechXL	Portfolio Manager	6/5/2021, MS Teams call

FIGURE 8 INTERVIEW OVERVIEW

The interviews have been semi-structured, allowing for an open conversation that is still being outlined by the relevant topics that came forward from the conceptual model. An open conversation is particularly important when investigating someone's perspective on certain topics, without steering the subject towards a particular context. Especially because part of the research is understanding the relative importance of certain topics, which is why part of the outcome is in the spontaneous conversation.

Next to researching individual perspectives, an important part is investigating processes through 'retrospective interviewing or by constructing a processual account through the examination of documents' (Bryman, 2016, p. 396). To this end, part of the interview questions

⁶ More VCs have been approached but were not able to participate (Rubio, Achmea Innovation Fund, Shift Invest, MainPort Innovation Fund, OostNL)

⁷ Due to unforeseen medical circumstances the research time of this Master thesis has been significantly extended, which also affects the interview time range (November 2020 until May 2021).

⁸ This table is partly anonymized, names are available in the raw data attachment. Some funds are not anonymized, simply because of their unique position it will remain recognizable.

⁹ Only interview that was conducted in English.

is about understanding investment processes, supported by documents that were shared by the interviewees, or public online communication.

The interview guideline¹⁰ consisted of questions related to investment processes (general questions) and questions related to the conceptual model (theory-based questions) and included potential sub questions. Most interviewees were Dutch, making that the relevant language for question preparation and conversation.

Due to the covid pandemic, most interviews were conducted via an online call. All conversations have been recorded and turned into literal transcriptions. Together with the documents that research participants were able to share, as well as screen shots of online communication via company websites, they form the data that was uploaded on the qualitative data analysis tool Atlas.ti.

The role of the researcher

In this study the researcher takes up an important position, not only as an independent researcher but also as someone who plays an active role in the investigated context. That is because the researcher has combined her master study with working for a deep tech venture builder and investor in Eindhoven. The research problem is formulated in collaboration with this company, HighTechXL. The fact that the researcher is familiar in the field and is linked to one of the cases, is important to consider. Throughout the execution of the research, she has continuously monitored her position with regards to the research subjects and the research objects. In different occasions this demanded different choices of behavior, such as leveraging her position in the network for gathering research subjects and emphasizing her neutral and confidential scientific position during the interviews. One of the case studies include some personal observations from the researcher's perspective as part of the company.

3.3.3 DATA ANALYSIS

A code system was developed and applied to interview transcriptions. Using Atlas allowed to code and group both documents and interviews seamlessly. In this paragraph the selected groups and codes and how they are implemented are used.

Choice of codes

The coding is based on the conceptualization of institutionalization of frames that is the result of chapter 4.1. It is important to note that the codes represent a context that is elaborated upon in that same chapter. For example, *mech_frame break_internally induced reframing*, is given meaning through literature review:

“Exploits institutional contradictions within established VC frame: it makes no sense to not include sustainability in a business decision as it shapes future markets, and investment decisions nowadays do not support sustainability. Want to reposition the role of VCs.”

Similar descriptions with indicators are conceptualized for the other framing mechanisms and field conditions (see figure 9). These are used to interpret the data and link relevant coding.

¹⁰ See attachment 1

Code	Subcode (#)	
Legitimacy Stance: LS_	Change (58)	
	Maintain (0)	
Power relations: PR_	Systemic (31)	
	Sharing (11)	
Framing mechanism: Mech_	None_	Maintaining frame dominance (2)
		Institutional distancing (3)
	Ambiguity_	Maintaining frame plurality (29)
	Frame break_	Externally induced reframing (42)
		Internally induced reframing (59)
		Importing a master frame (18)
	Keying_	Merging frames (119)
Situated improvising (28)		
Sustainability integration: Sust int_	Integration (88)	FIGURE 9 CODE TREE AND NUMBER OF QUOTATIONS
	Definition (54)	
	Obstacles (19)	

In addition, coding was conducted on the integration of sustainability. As part of the case studies requires an elaboration of how the funds currently integrate sustainability, these codes supported that analysis.

Coding process

As the literature input is not exhaustive and the point of this research is to understand how, in different occasions quotations gave new insights to these framing mechanisms and how they manifest in real life situations. A quotation is linked to a certain coding when it matches the theoretical conceptualization of that mechanism or field condition, or when it matches the frame amplification modes that are linked to that framing mechanism. The latter opened opportunities for more freedom in coding, which is particularly relevant for research that looks for qualitative insights that have not been theorized.

Because an important part of this research is in understanding which wording and phrasing is chosen by the participants, the coding process was not a literal translation of the theorized input. Instead, a free interpretation of the transcriptions was made. For example, sustainability is a word that is controversial in its meaning, so when coding sustainability integration, similar definitions such as 'ESG' and 'impact' are also analyzed.

Eventually, for the most used framing mechanisms (keying and frame break) the relevant quotations were regrouped to be organized by case to support executing the case studies.

3.4 RELIABILITY AND VALIDITY

In a non-experimental case study design, internal and external reliability are specifically at risk. Internal reliability refers to the extent to which measurements and analysis are consistent within the research. External reliability is the degree to which the study can be replicated with similar results. In addition, it is important to account for research validity, which refers to how the methods measure what they are supposed to measure internally and concerning potential generalization of results externally. Assuming social reality can hold several accounts, the quality process is quite complex in social, qualitative studies that study situations that are fluid in their nature (Bryman, 2016). The most prominent considerations are elaborated upon in this paragraph.

Since this research is a collaboration between a researcher and a company expecting actionable insights from this study, it has been necessary to continuously distinguish between the goal of the researcher and the goal of the company. Through research iterations and gained insights, the goals have drifted apart and moved back together on different occasions. By actively making room for this to happen, it has not biased the research process.

Another precaution on reliability was to structure data analysis in the most replicable way by analyzing interview transcriptions instead of interview summaries. This way, the interpretation originates from what is said directly, eliminating one step of interpretation. As the research objects are humans and human thoughts and considerations, it is important to note that the research will (partially) interpret the social world through their eyes. This effect is reinforced by the fact that the research subject specifically entails how these people interpret the concept of sustainability and their behavior because of this interpretation.

Internal reliability was enforced by analyzing every case in the same structure, both on the data analysis level using the conceptual model and writing the case study in the same format. An iterative process of moving back and forth between the research question, theory and empirical data allowed for a more robust internal validity.

Finally, this is a comparative case study. Although case studies, in general, are not meant for large generalization, this research opted for selecting five exemplifying cases (Bryman, 2016) of Deep Tech VC funds. The number and the fact that they are somewhat representative for the sector make that one might expect similar results in other alike VC funds.

4 RESULTS

This chapter presents the results of the qualitative data collection in five deep tech VC funds in the Netherlands. Each fund is presented in a case study that links the empirical data with the theoretical input on frame transitions in the deep tech VC investment field. The cases share a structure in answering the sub research questions *To what extent are traces of the theorized frame institutionalization patterns on sustainable investment visible in deep tech focused VCs? What is the relative importance of these traces in the investment process for VC investors? How have deep tech VCs materialized their sustainable investment frames i.e. in organizational processes?* Finally, all case studies consist of a conclusive note where the frame institutionalization pattern fitting with that case study is discussed.

4.1 CASE 1

This is an independent VC fund with a strong focus on emerging technologies in the Dutch market. In online communication they concentrate on five market segments: semi-conductors & high precision engineering, nano/micro technologies, medical technology devices & diagnostics, food & agro technology and clean energy technology. The focus on innovative technologies furthermore shows through key collaboration partners such as the technical universities of Twente, Delft and Eindhoven, University of Wageningen and the Dutch organization for applied scientific research TNO. The fund holds resident in Amsterdam and on the High Tech Campus in Eindhoven.

In the interviews the tech centered perspective is confirmed and emphasized¹¹. According to one of them, all sixteen employees have a technical background, however this statement is more valuable for the sentiment than the factuality: one of the employees participating in this research has a business background. Even so, this fund sees that having mostly technical expertise in-house instead of the financial background that VCs usually have is rather unique.

On a more emotional level, multiple statements were made on their love and appreciation for and trust in technology, as one participant said

'...and then you actually get right to the personal part because I have a lot of love for technology ... I'm very interested in technology but not the easy technology but the very complex technology where people at the Universities put man-years into it and make a value proposition out of it ... it's just affinity with technology!'

and similar statements were made by the colleague

'... my heart is more in deep-tech from my nerdy geeky background ... missed the technology-angle in my work ... as said, I have a heart for disruptive, beautiful technologies that also make the Netherlands stronger as an innovation landscape.'

In an interesting counteract, the fund's ESG officer does not mention the term technology once during the interview.

The fact that the fund has a part-time in house ESG-officer and has reporting obligations to PRI, is partly due to demand by some of the LPs. The funds' 2019 ESG report shows that by

¹¹ Full interview transcripts of a co-founder, partner and ESG-officer of this fund can be found in the appendix.

then 12 out of 16 startups had an expected positive impact on one or more SDGs through their core activity, a characteristic of societal impact investing. The other companies have a secondary positive societal impact. In addition, the report shows that qualitative discussions have been started with portfolio companies to understand and mitigate ESG risks and seize opportunities in that context. The fund is working on a model that could measure sustainability maturity for start-ups, to support these discussions and as a tool to communicate with investors, startups, and other stakeholders, specifically fit for the hardware and deep tech context.

4.1.1 FIELD CONDITIONS

Through these conversations, via the Fund's website and an internal ESG report published in 2019, different insights can be drawn upon the applicability of the theorized institutionalization patterns for sustainable investment from the organizational context of fund 1. First, in the legitimacy stance experienced towards the field they operate in, once again a strong connection is drawn with technology. Most quotations linked to legitimacy are in the context of deep tech innovation and societal impact characteristics compared to marketing and finance focused field characteristics, such as one participant states:

'My firm conviction is that today's problems are not solved with marketing, or with apps - they are solved with deep-tech and bio-tech... But if you look at a lot of PE Funds, VC Funds, they are only concerned with earning an extra percentage here and an extra percentage there... It is no longer about the company; it is about financial engineering...'

On multiple occasions the direct link between deep tech innovation and significant, societal impact is put forward in combination with the delegitimization of the traditional VC model that focused on finance first and commercial opportunities, and how the lack of technical expertise in the VC field is affecting the amount of true deep tech investments that are made. However, all participants also put significant importance to the investment characteristic of putting finance first, suggesting the core of the business is in line with field legitimacy:

'And of course, we have to make money, we are a private Fund, we are not a grant fund...But we always look first: is the technology uniquely defensible and what can it potentially mean... [Change] is necessary and we are doing that, but the moment you set up a fund and only work with partners, you all agree on what your goal in life is as a fund, and of course there are sustainability criteria and a mandate, but the most important pillar is the financial return, that's why they step in. In our case, they are pension funds, and yes, they do have to sell to their clients why their pension is not being indexed again.'

All interviewees foresee the issues that the finance first focus cause for true sustainable investments and different traces of a desired change in the field can be found throughout the conversations:

'I don't think VC, because it's so one-dimensionally judged, is ultimately the best tool for achieving sustainability. However, you do need that type of money to bring some technologies to market ... ultimately the team is judged on the financial return. So it will never just be sustainability that's going to beat the clock ... if some economists are finally calculating in that direction that you create a balance sheet where the social impact is finally included instead of purely the financial balance sheet ... For me, the real transition is that your balance sheet thus includes social impact, but that's much further away ... You can pretty much quantify that to some extent. If you make that move as an economy then venture capital is again the ideal blind tool ... So that would be a long-term dream for me, but

I already had it fifteen years ago and at that time it was still as if you see water burning... that would be the good thing... then capital flows go to the things that are more desirable as a society and then financial return is no longer the only motive'

The ambivalence in the way field legitimacy is experienced when it comes to sustainable investment is also reflected in the perception of power. The taken for granted element of power relations is clearly coming forward in the wider economic context, such as when the ESG officer sees a part of the issue not only in the lack of valuation of sustainable factors, but also that valuation of non-sustainable companies is not yet affected by sustainability factors thus still money can be made in non-sustainable markets, as explained:

'There is definitely something missing in the economic model...If we were to include all the externalities of production in the final price of a company or in the price of a product, then it's immediately fixed. Then the choices that are made instantly become very different... But the chances are quite high that we will continue to accept it, because we have known it for a long time. So you can get away with that as a company for a very long time. And you can marginalize the risk. You can put the responsibility on others.'

One of the participants sees that this transition is constricted by the high interdependency of the financial sector to other elements of society, such as funding of pensions. The transition towards including social and environmental externalities will cause a re-valuation of large negative impact companies such as Shell, and as a result this will negatively affect the pension level of many people which can be considered a negative social impact as well. Lobbying power from such dependent sectors and large financial institutions is underpinning one participant's feeling of 'utopia' when it comes to the integration of societal factors in investments, although with the hopeful observation that small steps could do the trick in about 20 years. This stand is complemented by the company's ESG officer who believes that VCs have the power to influence startups to implement sustainable business strategies such as ceasing sustainable business opportunities linked to their technology and implementing responsible supply chain practices.

4.1.2 FRAMING MECHANISMS

For a starting point, the fund has integrated the notion of sustainability and societal impact in their online communication (website) and all interviewees underpin that their investment decisions are partially based on the applicability of ESG and sustainability. This is in accordance with the fact that there are no coded quotations with the framing mechanisms 'maintaining frame dominance' or 'institutional distancing' with regards to the dominant traditional economic and financial frame.

From three interviews most quotations could be linked to the frame lamination type of keying, most corresponding to the mechanism of merging frames. It appears that because the fund does not move away from the traditional VC investment methods whilst at the same time adding sustainable investment procedures, they are dependent on finding ways to marry the two different worlds in an efficient way through keying. A fundamental part of this pattern is understanding from what different original frames a new one is formed; this is not straight forward, and different observations can be taken from the data.

One perspective is that true societal impact is dependent on real disruptive innovation, which on its turn relies on deep technologies. The technology focused team makes connections

between this conceptualization of disruption for sustainable development and disruptive innovation, both measured through the size of societal impact. What remains however is whether that technology induced disruptive societal impact is positive (sustainable innovation) or negative (non-sustainable innovation). Through many different examples, the team shows a natural preference for positive societal impact, as well as recognizing that it is default for the engineers they work with:

'... strongly reducing rare earth metals in certain solutions is really a significantly different way of thinking. You don't see that very often because that is an incredibly complicated fundamental technology, but if you do come across it once, I get excited about it too... I think that a great many scientists are so socially aware that they are very much, consciously, or unconsciously, looking for technologies that are not only disruptive, simply to make money, but also disruptive in terms of positive social impact. I think that's much more subconscious in all engineers...'

Another perspective is that of the early stage of the startups the fund invests in and how that affects the application of ESG methods on the production side of the company. The fund is searching for ways to merge the responsible business frame to the agile pre-production stage of a startup. The fund's ESG officer notes that ESG measures and standards are specifically designed for large corporations that have a production line set in stone, whereas VC funds work with companies that typically are at the phase of product development – which requires not yet a production process and supply chain to be reported on. In addition, large corporations might have people and systems dedicated to this subject, where startups have an agile and development focused team. As a result, the fund is actively gaining insights and experiences on what responsible business for young company means and in what way measuring and managing is most effective and practically executable on the long term when it comes to social and environmental impact as part of building a *'fully-fledged and professional company.'*

Most evident is the transition towards adding societal impact and ESG factors to the investment decision. The fund's decision criteria primarily focus on financial return and technology potential, and in the past years the addition of societal impact has started to move from informal relevance and individual preferences to formally being part of the investment thesis. They import the master frame of the SDGs for context. However, there is continuous tension between the idea that societal impact is just as important as financial outcome and technology, or alternatively it is a second-tier selection criterion.

This tension also resonates in how the team is trying to maneuver in the traditional system and at the same time question the financial market and their role in it. This is reflected through a large share of quotations linked to the frame lamination type of frame break. All interviewees explore *'utopic'* future scenarios where environmental and social values are included in the balance sheet however recognizing that current system does not support such a transition. However, these explorations of a different economic system are mostly passive observations and no active framing or change of behavior accordingly is observed, as one participant said:

'And then an economist who can calculate the cash flows is just as important as a lifecycle engineer who can calculate what the CO2 footprint of a product is going to be. Because that has as much impact on the balance sheet potential as commercial returns. But I'm afraid in our economy and our capitalist system that we're a long way from that. But that, as far as I'm concerned, is the route that will have the greatest impact.'

In addition, intrinsic motivation to do good with technology and external push from some LP's and startups suggests that the team is on the verge of a frame break of traditional finance and VC. This is a more active process and different traces of this frame being institutionalized can be observed, e.g. how the team hired an ESG officer to professionalize the integration of sustainability and are reporting to the Principles of Responsible Investment (PRI). The ESG officer sees that these decisions fit in a long-term mindset that not a lot of investors have:

'To see the value and also the financial value of investing in sustainable businesses that just really does require a long haul.'

As to why VC investment is relevant, different motivations are given to reframe the idea of finance first into allowing the companies and innovations of the future to thrive, such as the first quote of this case study, and:

'What we invest in are the companies of the future. And those are often young people who understand the problems of our time very well.'

4.1.3 CONCLUSION: FRAME INSTITUTIONALIZATION PATTERN

The team is very conscious about operating in a traditional economic field. In the back of the minds, a frame-break is emerging based on the flaws of the current economic model, such as the lack of non-financial externalities on the balance sheet. However, the fund would not exist without these traditional powers like pension funds and banks, so financial return remains a focus. Different examples show the fund team is challenging the legitimacy of the financial field, and through typical VC practices, they experience some power to change the frame. The most important one is that they have an investment mandate on deep tech and that the fund is actively merging the frame of deep tech innovation as a market opportunity with deep tech innovation as a sustainable development opportunity. Team members show a real passion for problem-solving technologies, the more societal impact a solution has the better, influenced by the engineering and scientific background of the team. The team implements ESG factors in the due diligence phase when selecting whether a proposition is promising. In addition, the relatively early stage of the startups plays a role. As a portfolio manager, the fund can challenge the team on responsible business conduct as part of building a mature business. In addition, early-stage investments are the companies of the future, which forces the fund also to consider what that future looks like and who understands that future well. Altogether, positioning societal impact and ESG on different traditional VC practices, this fund primarily shows traces of the opportunistic 'Evolution' (C) frame institutionalization pattern.

4.2 CASE STUDY 2

This fund is originally based in the US, with a Dutch branch that is the context of this case study. In 2014 they came to the Netherlands with the observation that a dedicated deep tech fund was not yet present in the Dutch market. The fund holds resident in Enschede in close perimeter of the Technical University of Twente, with whom they have an intimate relationship through getting first insights in newly developed technologies.

The investment focus of this fund is on high-tech and hardware, where 'high-tech' as a definition is purposely chosen over deep tech as they see deep tech also linked to software. Specific high-tech sectors they communicate on are Photonics / Optics, Micro- & Nanoelectronics, Advanced Materials & Nanotechnology, Medical Technology, Cleantech / Energy Transition, Advanced Manufacturing & Robotics. This should be patented and

disruptive technologies, and the companies should be very early stage. In their most recent mission statement this translates to 'We make impact investments in key enabling technologies.'

The focus on disruptive innovation and the interest in groundbreaking, key enabling technologies is commenced by the fund team. Their interpretation of that is:

*'... core engineering ideas ... in a very early stage... there should be a patent on the idea, it should be innovative, multiple [application] areas we can work on... *fund 2* is willing to invest in completely paradigm shifting ideas. If somebody comes with a radical idea, which is really out of the way, we're still open to invest.'*

When international frameworks on sustainable development and sustainability entered the investment world, and their LPs started asking questions, the company did an impact assessment in hindsight and concluded all portfolio companies match to seven selected SDGs and fit in their own perspective of ESG. In online communication the fund also refers to different international standards and guidelines: OECD Guidelines for Multinational Enterprises, the UN Guiding Principles on Business & Human Rights (UNGPs), and the IFC Environmental & Social Performance Standards.

Apart from societal impact influencing the investment thesis, there are no signs of further materialization of sustainability.

4.2.1 FIELD CONDITIONS

Conversations with two employees revealed different insights on the team's perspective of the field conditions they operate in. Both participants challenge current market dynamics in different ways. Where one sees insufficient environmental and social impact solutions,

'it's [sustainability] a good area that you're trying to work on. I completely identify with it, because personally I also feel that we are not doing enough for the planet.'

and is exploring the future of capitalism through reading books such as "Creative capitalism" by Bill Gates, attending conferences, and watching documentaries. The other challenges the current adoption of sustainability in business, sharing experiences she had in the international and Dutch institutional investors world where sustainability and diversity is being mis-used as a marketing strategy, e.g.:

'And he said "to be honest ... I don't give a shit about ESG and sustainability, but they ask for it, so I put some documents out there, for me it's just marketing to bring them in as a client, but I really don't give a shit, I really see it as a marketing tool." And then I was shocked, because I thought, gee that's not coming from withing at all, it's not intrinsic.'

And an important part of her motivation is to counterpart the bad image that private equity has gained through similar practices, as she sees VC can be very valuable for society:

'Sometimes PE investors have a bad image with some people, I want to counter that very much. I want to show that we invest in a socially responsible way. And if I want to do that, then I also must propagate it myself and comply with it, and I find that really very important. Because then I can say from a sincere point of view: I believe that the investments I make can contribute to a better society.'

In an interesting comparison, the interviewee sees that an important challenge in avoiding greenwashing is that it is not so obvious whether someone is doing what they say they are doing, as 'diverse washing' or financial returns are more noticeable on the first glance, given

that diversity is rather visible in the team and financial statements can be checked through bills and administration.

Finally, the legitimacy of benchmarking in the investment world is discussed. One team member sees that often investments in sustainable innovations are seen as less profitable, on the contrary she argues that sustainable investments are inherently more innovative and therefore today investments will be like seed stage investments rather than later stage VC. These investments are inherently riskier and comparing later stage VC investment ROI to early-stage sustainable investments nowadays is not fair, as today there are not yet enough examples to make fair similar development stage comparisons.

'That's actually what I'd like to give to the whole impact investing world: articulate much more clearly that you're taking the risks that the seed venture capital investors are taking, so the very youngest companies, when they're just beginning, start benchmarking against that.'

More on benchmarking, the team considers the current lack of standardization of sustainability measuring and reporting confusing and sees it has a counteractive influence on including sustainability.

With regards to power relations, it seems that traces of both streams can be identified. First there are different notions of the team feeling capable of distancing from the traditional market with their investment choices and the story they tell, which is linked to the concept of power sharing.

'And if then, so to speak, a semi communist would say, "Well this venture capital, is it virtuous?" Yes, of course in the investment world you have people who only think of themselves, but you have that in every sector. And we really do our best to contribute positively to society.'

On the other hand, there is the taken for granted perception of the financially based relations between different industry players

'But again, we are an investment fund. It is not our money; it is the invest money from our partners right. So, we cannot invest in a project which is for charity, or for non-profit, that is not possible.' and *"Look *fund 2* is a finance first investor though, as I call it, in the sense of we have responsibility to the people who have put money into our fund, that we get good financial returns. So that's at the top of our mind, that's going to continue to be the case.'*

4.2.2 FRAMING MECHANISMS

Throughout the conversations no signs of maintaining the status quo have been detected and limited traces of maintaining frame plurality can be distinguished. The latter is building upon the previously mentioned discrepancy between self-proclamation of making societal impact with key enabling technologies, whilst also specifically distancing the fund from being an impact fund as it has a finance and technology first focus, and

'... a true impact fund considers its financial return less important. And that means most impact funds actually perform less financially than a mainstream fund.'

This hints towards a perspective where impact funds are still something different from actual investment funds as they do not fit the traditional qualification of focusing on financial return. A comparison to 'not being charity' is used to make a point on profit making versus societal impact.

Most quotations were evenly distributed over the framing mechanisms frame break and keying. To start, one of the participants was consistent throughout the whole conversation on the deep-rooted connection between innovation and sustainability. This appears to be a frame break induced by internal repurposing of the concept of innovation and the application of high tech, hardware technology, as stated in different occasions:

'We believe that new high-tech can only be innovative if it's also sustainable... because we get into that physical technology, that hardware, it has to be really sustainable, otherwise you don't have a story at all.'

This idea is supported by the colleague who approaches this concept from the idea that the team has the standard practice to orientate on societal problems to identify future innovation, and consequently, investment areas:

'[Three of us] are very much focused on areas where we feel that whatever we do is going to make an impact on society. And we think in those directions. So, when I meet with [team members], we do think in those ideas. What is going to be the next problem or not? ... For instance, population is growing, right? ... how can you think of ways to provide energy to the growing population in a sustainable way? How can you think of growing crops in a sustainable way? ...'

Through using words linked to an emotional state and honesty, such as feeling, believing, and lying, it appears the team has a strong connection to serving society within and outside the context of their job:

'I very much believe in doing service in anything I do. What I mean by doing service, whatever innovation we do, it should have some positive impact on the people who are using it. That is very essential... I personally like to read these kinds of books¹² and I'm sure even [colleagues] like to read these kinds of books. So, I think it's, by choice, that we like those kinds of ideas.' and *"I really grew up with a social consciousness; contributing to society. I cannot look myself in the mirror and lie about what we do. I don't want to invest like that."*

Externally induced framing is suggested through the fact that the fund's LPs expect an ESG report from the fund management, which was the cause for the team to reframe themselves from a technology only fund to one that includes 'impact' in their communications. That is because in hindsight the team realized that all previously made investments fit in one of the ESG categories. In addition, the company adopted the SDGs as a method to frame their societal impact, again by a portfolio analysis in hindsight. An interesting insight from the interviews is that one (out of three in total) team members was not familiar with the SDGs and did not know the company had already integrated them in communication.

Turning to keying as a framing mechanism, different streams of thought can be identified. Prominent is the idea that societal impact is part of the investment focus and thus gets a place in the investment criteria. The team also gives different examples of how they apply an exclusion strategy to avoid investments in non-sustainable markets and technologies – and this exclusion strategy on its turn is partially based on an investment focus that covers the sustainable alternatives:

¹² Creative Capitalism by Bill Gates

'I do receive certain business plans which are completely focused on the oil industry... or on military technology. And those cases, we don't invest in actually. We haven't invested to date in any kind of military based technologies or any kind of oil extraction-based technology. We haven't, because our focus is on renewable energy' and 'So, we don't want to invest in technology that harms the world in any way. Whether that is the environment or humanity, that is impact for me.'

The team mainly switches between examples and statements that emphasize how they stick to the traditional VC model of financial profit and LPs first, whilst keying the subject of how that money is made to societal benefits and sustainability. The team passionately shares different examples of the startups and technologies they invested in and how they can change markets and futures:

'they have a new invention that you can use nanotechnology to vaccinate without needles... Also in the past, and especially in developing countries, of course you had that HIV could be transmitted through needles. Unfortunately, that still happens in some developing countries, and that's something you can prevent with the new technology. To me that has such an impact in the field of healthcare, that you can prevent that. I think that's fantastic.'

The ambivalence one participant had in explaining how this is not an impact fund whilst stating they are an impact fund, is a good exemplification of them trying to give new meaning to being an impact fund and at the same time finance first fund. She sees that part of this challenge is making investors understand that including impact is does not mean giving in on profits, as also previously mentioned the risky and early stage of impact investing is nothing different than other early-stage investors. It is key to understand what benchmark to use – i.e. not the 'charity like' investments in under developed markets.

'There are just very few established companies yet that are ESG-impact, because that actually didn't come up that long ago. And what you also see a lot, and I sometimes find that a bit too one-sided: then you have a lot of impact funds, which then invest in startups in Africa. And they do that because the wealthy families in their funds say to themselves: Oh, if the financial returns are not so good, that doesn't matter, because I have done something good for Africa, to help those people move forward. And that's fantastic, but then it goes in the direction of charity and then you get people saying: Yes, that social impact, yes that doesn't deliver such financial returns either. No, but you have invested in small companies in Africa, where the financial returns were not central anyway.'

4.2.3 CONCLUSION: FRAME INSTITUTIONALIZATION PATTERN

This fund challenges the legitimacy of the financial field mostly on the discrepancy between what is said and what is done, relating to concepts like greenwashing and diverse washing. In addition, it is concluded that sustainable investment opportunities are often wrongly benchmarked, as they are typically high-risk and very early stage. Still, they get unfairly benchmarked to later-stage low-risk investment opportunities. The traditional focus on financial return is a given for the team, but they challenge that by trying to show that sustainable impact does not have to mean giving in on financial profit, trying to merge the frames. The team is very passionate about societal impact. Linking that concept to innovation goes beyond merging frames and moves into a frame-break in this case study. That is because they do not only emphasize the fact that societal challenges would benefit from technological innovation but in addition state that technological innovation is not disruptive if it doesn't have a high societal impact. However, as they continue to operate from finance first focused

perspective, this perspective turns out to be an informal guide. It lacks operative concretization, which fits the framing mechanism of situational improvising. Finally, the fact that the team sees an impact fund still related to charity makes them not identify as one, while they do consider themselves as impactful. Altogether, the fund shows traces of different frame transformation patterns, but in combination with actual execution, the most prominent position is that of the opportunistic 'Evolution' pattern (C).

4.3 CASE STUDY 3: BRIGHTLANDS VENTURE PARTNERS

Brightlands Venture Partners is an independent VC fund manager focused on regional development of Limburg, a region in the south of the Netherlands. The fund is operating from an ecosystem perspective, meaning that the investments can benefit from regional expertise and ecosystem strengths, and vice versa. The company has managed three fund cycles until now, in the thematic areas of smart materials, life science and agri-food. A new fund is in the making for which they will turn to health and sustainability as new strategic overarching themes. Important LPs for the fund are DSM, Rabobank, the Limburg province and LIOF¹³.

Online communication – also underpinned by two interviewed team members – clearly shows a focus on impact projects, stating that the fund's goal is to *'accelerate businesses that impact global environmental and health challenges.'* In communication other investment criteria are separated from this goal. The company has no startup development phase that interests them and prefers to invest in collaboration with other investors or subsidizers as a syndicate.

The fund presents their portfolio on the website within their newest categories: 'sustainability' and 'health'. All startups are put in either one of these categories, suggesting indeed that societal impact has a central position in investment decisions.

Ways of doing this are including impact and ESG related questions in the DD phase of an investment. This list is supported with an LCA where applicable, this is on responsibility of the startup, but they do have partners that can help the startups in making one. After gathering the information this fund is showing a holistic approach to sustainable impact: this is not only about one-way impact, but it should also be better than what already exists and if there are ways to make it better the startup should explain how they will do that through presenting a theory of change.

4.3.1 FIELD CONDITIONS

In the interviews the field legitimacy stance gets direct and indirect support towards changing it. An example is the positive discussion of an internal impact project that focuses on the 'Theory of Change' show that the fund is actively involved in changing field standards. Most outspoken are the direct statements by the Fund's partner on what she believes are bizarre and ridiculous ways of how the world is 'working', with examples linking to tax schemes and business and market practices

'So I don't want to make money on the backs of an animal, a human being or the climate. That's also about a moral compass... it's also [for me] about contributing to technology that

¹³ Regional development agency of Limburg

contributes to that in a way, and not something that contributes to moving further away from the goal of consuming so much together that the globe can't handle it... Those are all such crazy practices. And I can get upset about that again now that I'm sharing it with you. I really try to focus on the things that do give me energy, but there really are some things very crazy in the world though'

And this applies to the VC field as well, which is considered traditional and finance focused, and both on personal level as well as on fund level there is a goal to shift that mindset:

'But I also believe that the VC industry, just like the PE industry, is still somewhat traditional. People typically look very much at financial projections, while I would very much like to make that combination... so it's really about which of our investments can really contribute to and have an impact on...'

And according to the partner that shift has been set in motion, changing the legitimacy stance towards traditional business and finance, but interestingly also towards what sustainability means – moving from a soft, hippie viewpoint towards being the only license to operate for true breakthrough innovation and business development:

'It's no longer a goat wool socks item, right. I really believe that the tipping point, the paradigm shift, that we are in the middle of ... It is no longer something for a few believers. I have always believed that you can make business out of it and that that is even the only license to operate, so for me, as an investor, it is also well-understood self-interest when we talk about innovation, that you invest in the companies that will soon have a license to operate when it comes to the consumer. That's not going to happen with polluting innovations. That doesn't go with incremental innovations... the real breakthrough innovations are about really revolutionary impactful aspects.'

Both interviewees confirm that the fund does not feel restricted by the powers that play in their field. They see that their investors play a big role with their traditional finance first focus, expecting return on investment before anything else. They however have the impression they can move their way around large, institutionalized parties, and potentially influence them through their work.

'A bank is really supportive, and I think also a frontrunner when it comes to impact... Rabobank is an important partner for us. It is also a shareholder in the funds. So no, I have nothing to complain about: the support of financial parties. There is also enough money available in the market.'

However, some examples given by the team obviously point out some big, institutionalized issues that through market manipulation affect true efforts towards sustainable innovation:

"In my opinion, there is still too much of an established order with established interests blocking innovation for too long. Lobbyists of large corporates, who may be doing some greenwashing but are otherwise working very hard to keep existing profit models intact as much as possible ... For example, in renewable energy, where biomass co-firing is still subsidized. Then I think: guys, we must stop this very quickly, it frustrates the real innovation to use biomass as a higher value than energy as output.'

4.3.2 FRAMING MECHANISMS

Most frame break mechanisms can be linked to general change of mindset in both business and society – as previously discussed in field legitimacy. This results in the change of perspective of what makes a good business and what role sustainability plays in that. The fund has a way of including society and the external world in their answers, suggesting their frame break is not only a construct of their own revaluation, but also influenced by global external trends. The consensus is that the only future proof way of building a business – and having a license to operate – is doing that sustainably.

'It's also really about a different way of organizing society and business ... and a globalized world' and 'I also think that other companies are slowly beginning to see ... that you don't have a sustainable business model if you're not sustainable'.

In addition, the team sees a particular role for VC in that transition, as it enables true disruptive innovation with the early stage and high-risk investment focus, by funding market entry. By doing this they seem to promote a frame-break of innovation and its purpose, that they feel like is evidently linked to sustainability. Another frame-break as a result is that of avoiding a distinction between impact investors and non-impact investors, as the two are no longer mutually exclusive.

'It's about breakthrough innovation, that doesn't happen in corporates. It happens through the early adapters... innovators who already see the world of tomorrow. And who therefore also sense that we are going somewhere else. So, it makes sense to me that it's with VC.' and *"There are so many technologies that are probably all equally good or equally bad. But with VC you still give a certain technology a chance to find a market"*

Although the VC is giving signs of seriously changing the way of looking at VC investing and sustainability, the major stream of thought goes to the frame mechanisms of keying, where different existing frames get merged. Some of these outcomes are very close to the eventual frame break perspectives, the difference is that in these traces the underlying mechanisms were more aligned to keying practices. A first merge that is repeated by online communication as well as both research participants, is between financial shareholder value and external impact. It appears that BVP simultaneously identifies as impact fund as well as finance first fund and aligns them through their investment focus being a combination between disruptive innovation and societal impact. The fund sees opportunity to make these two elements part of the same story:

'So we're just working, if you look at our portfolio, ... with technology that's better than what's being used today ... We've been impact investors as long as we've been around if you ask me. That's really all about those innovations that are going to shape the world of tomorrow. So an impact investor avant la lettre ... Yeah, I can't name a company [investment] that doesn't fit into that.'

Simultaneously, one of the interviewees indicates that the fund is going through a process of professionalizing what exactly impact and sustainability means for BVP, trying to merge business measure and manage practices with sustainability. Reporting on sustainability and future impact of their investments before that was occasional, now they want to make that a parallel process next to financial reporting, thinking this will legitimize their statements on impact investing. This is also requested by part of their LPs. However, the fund is still careful in positioning this new approach towards shareholders (LPs) as this is only a side part of the job and therefore not a reliable fully integrated process:

'Look, you don't know how fast it's going to be implemented, we're also doing this next to our regular work so sometimes it's on hold a little bit longer than you'd like. So we also don't want to always wake them up and have them say "oh, next week we want to see an impact report"'

Personally, her perspective is shifting from sustainability being environmentally focused only to also including solutions in the 'social' sphere. On company level, together with an external impact consultancy Sinzer¹⁴ they have defined two dimensions of impact: first is the daily business practices and 'focuses on company operations hygiene', which is where they link ESG to. The other is the potential future contribution of the product to people and planet, measured through impact on SDGs.

Sinzer, part of accountancy firm Grant Thornton, is an impact consultancy that sees a future where all products, services and activities add to value creation on financial, social and environmental level.

Another element of this new approach is the integration of the 'Theory of change', where it is suggested to make every startup explain their theory of change before the investment is made, as way of doing an up-front impact assessment. The theory of change consists of an end-goal and backwards planning of the inputs and activities to make that goal or change happen. All this helps in giving business value to sustainability and is an example of keying towards a new frame for sustainable investments. However, this is also one of the elements that the fund struggles with as not all environmental and social externalities are easily translated into business proof targets and KPIs:

"With agrifood you can indeed say ... we recycle this or we use residual flows ... or you ensure that the yield per country is higher or you ensure that the soil diversity is greater - and with health I just have the idea of okay life expectancy is longer ... which many start-ups find really difficult to calculate, but often it is also offset by the fact that it is much more expensive ... but then you no longer need the 10 other treatments you would normally need so ultimately you can save on that. But I do notice that we find it difficult to link that to impact or sustainability ... If you look at how medicines or medical devices are made, it's not always very sustainable but on the other hand you can save new lives. I do find that difficult - not as easy as "we save so many tons of co2."

This struggle does not affect the directions of investments, as it only appeared after the fund wanted to put their impact claims on paper – which did not change their strategy or investment focus.

4.3.3 CONCLUSION: FRAME INSTITUTIONALIZATION PATTERN

With regards to the field conditions, two main streams of thought are identified. First is the belief that the economic model is dysfunctional and needs profound transition, and the established order is keeping that in shape with unethical lobbying and market manipulation. Second, however, the fund itself feels supported by their rather traditional LPs, such as banks, in their quest for sustainable and impact investment. Although a discrepancy, it can also be a sign that they want to change the legitimacy stance but do feel they share power and influence

¹⁴ <https://www.sinzer.org/about>

with some of the prominent players in the field to make that change. The fund is also merging sustainability and disruptive innovation frames, as they see that one cannot exist without the other. They do not see disruptive innovation happening in large and incumbent companies, resulting in a prominent role for startups and VC for sustainable development. The latter is being sabotaged by the manipulated market and lobbying for non-sustainable companies, as that is blocking room for innovation. The fund is dedicated to professionalizing their informal sustainability practices in two ways: the contribution of the solutions they invest in should have considerable societal impact, and the business processes have to be as sustainable as possible. Through internal reframing, the fund is redefining what it means to support and build businesses. In conclusion, this fund finds itself between the frame institutionalization patterns of moral duty 'revolution' (A) and opportunistic 'evolution' (C).

4.4 CASE STUDY 4: BOM BRABANT VENTURES

A development agency like Limburg is also present in Brabant: the BOM¹⁵. Part of their business is investing in early-stage technologies, developments, and startups through Brabant Ventures. This VC fund invests both money as well as knowledge in the form of coaching and business development programs, all aiming for companies that are part of what they qualify as Brabant top sectors: High Tech Systems & Materials, Agrofood, Biobased Economy, Life Science & MedTech, Maintenance and Supply chain. The VC also divides its investment team in different thematic areas. For this research two employees have been interviewed, one involved in high tech systems and materials (HTSM) and one in soft-tech. The second does not qualify deep tech innovation; however, his insights are relevant from company perspective.

BOM sees itself as an enabler and builder of a '*strong, sustainable future proof Brabant economy*'. The fund invests in very early-stage technologies to gap the so-called 'valley of death' from proof of concept towards later stage VC funds. During the conversations this precarious position between promoting the most innovative new technologies in the riskiest phase of their development whilst also investing market conform comes forward as an important part of the role that the BOM wants to play, especially by collaborating with multiple investors.

'Our way of still being able to play that role in that place where the market fails is actually by still investing in that early phase, and we demonstrate our market compliance because other VCs actually step in with us in a kind of co-investment model.'

The fund is a public organization funded by the regional government (Province of Brabant) and ministry of economic affairs and climate. These government institutes therefor have a large influence on the strategic direction of the investments, this makes the fund slightly different from the other cases. Effectively, the province decides on the fund strategy by presenting a couple of societal goals every 4 years and having the BOM translate that to their capabilities as an investment company. The newest cycle focuses on the following societal goals: energy & sustainability, agriculture, health and a sustainable and competitive economy. As a result, the investment arm of the BOM, Brabant Ventures, has a clear societal impact strategy also framed by the SDGs.

¹⁵ Brabantse Ontwikkelings Maatschappij, regional development agency of Brabant

From online communication as well as emphasized by the interviewees, it appears the company until now has worked with an exclusion mindset: startups and investments that are not explicitly bringing innovation for the SDGs might get an investment based on the funds' financial goals. Non-sustainable startups however do not pass the investment brief, as it consists of an SDG paragraph where the investment analyst must concretize and quantify the investments contribution to the SDGs. Both interviewees point out the level of gut feeling and difficulties with quantification in this process. To professionalize and 'sharpen' this process, in the beginning of 2020 the BOM started working together with an impact consultant from the Impact Institute¹⁶ to make an Impact Journey.

The **Impact Institute** is part of True Price and has a mission to 'empower organizations and individuals to realize the impact economy by creating a common language for impact and providing the tools to use it. We develop open-source standards for impact measurement and valuation and provide organizations with the tools, training, and services to implement them.'

Next to the investment selection, ESG criteria are also increasingly part of the portfolio monitor and of the reporting. Conducting and discussing an LCA is mentioned as part of this process, however inconsequential. In a successful experiment, the energy department of the fund is working with carbon reduction as main KPI, and corresponding financial output are mainly supportive and not key. Throughout online communication and annual reports, different examples of reporting on such quantified metrics are found (BOM, 2019).

4.4.1 FIELD CONDITIONS

The conversations with two employees of BOM generally add to the online positive approach to ecosystems development and their view of the field they're operating in. From the interviews, only two moments of challenging the current field legitimacy can be identified, one relates to sustainability and how the use of this and similar 'container concepts' is blocking further integration of the concept in business.

Second, as previously discussed the BOM sees itself as solving a complex market failure in innovation and technological development, by gapping the investment needs between a very early-stage proof of concept and a later stage that includes market validation. By doing this, they take away many of the risks that would prevent traditional VCs to invest in these companies. Although this issue is seen as a problem of the current investment flow, the fund mostly sees this as an opportunity and their reason of existence rather than having to delegitimize this process.

'You could say that it is a bit like the valley of death... we see it as the part where the market fails. So the proof of concept phase and the phase where you can go to the market: that's where we are a bit in between. But you can hear from the way I express it that for us it's a real balancing act, because at the same time this is logical, market failure, valley of death [...] on the other hand we may not disrupt the market ... but must invest in line with the market. What's it going to be, I mean it's a bit of a weird story. So that's where you see our function then and that's why we often invest together with such a fund, and we do a kind of co-investment model.'

Moreover, many different examples are given how the BOM is positively influenced by regional field players on impacting the local ecosystem and society and how they work together closely with these parties. In a way the fund seems to be under the influence of external powers,

¹⁶ <https://www.impactinstitute.com/about-the-impact-institute/#Vision-and-Mission>

however on the other side having the backing of governmental funding they are in a very powerful position themselves as well.

'Look, the BOM and the province are only players [...] Then there are all those players who are active in that ecosystem who influence our actions. For example, ASML and Philips. If these parties now call for sustainably available talent in the region, for example, [...] that is input for us. Then we start thinking "gosh, shouldn't we also be thinking about what we can contribute to that" ... Not all policy is conceived in that turret in Den Bosch – it's mainly influenced from within the ecosystem itself. These are the corporates, fellow governments, brainport development. But it is also the investors in such an ecosystem, for example the owner of the high-tech campus.'

4.4.2 FRAMING MECHANISMS

Throughout analyzing two conversations, all traces of frame mechanisms can be linked to frame break and keying. No signals were found that suggest the fund is actively trying to keep status quo or keep different frames existing next to each other.

A frame break that stands out is how the BOM moved from a regional economic development agency to shifting towards societal development. Both from documents as well as the interviews, it appears that the BOM is following governmental trends to integrate sustainable development in economic development. In a way they have reinvented themselves through external pressure from the two key governmental investors (regional and national) and the trajectory of large market players in Brabant. As the region is excelling in hardware and technology, the BOM continues to focus on this as an enabler to reach their goals within the thematic areas. An important consequence of these thematic areas is that the potential societal impact of investments appears to be vital in decision making.

'If you ask what the influence is [of selected societal challenges] – it's very strong. If I come up with a case ... that doesn't fit in the list. Then ... I have to put in a lot of energy to get it through [...] we focused the past year entirely on energy transition and we looked at our portfolio and you see that of the new cases more than half are energy transition related. [...] You have to see us as a Brabant impact investor. So our selection criterion is what the parties contribute to the societal quests for this region.'

Both consider the BOM as an impact investor, a concept that according to one of them is changing from being a binary qualification to being something that can be executed in different percentages, or levels of intensity. Next to the regional development focus areas, the fund uses the SDGs to qualitatively narrate the societal impact of their investments. Working together with an external company, the fund is trying to make this more quantitative as well. Monthly meetings in which internal discussions are focused on solving the challenges arising from impact quantification suggest that they want to take this to a next level, a sign of a team that wants to promote a frame break of informal, soft reasoning towards logic and informed societal impact integration:

'So I think the great thing these days is that you don't have impact and financial return being two contradictory things anymore, which used to be often a bit of a gray woollen stocking, of either we're going to make money or we're going to do impact. The whole challenge is to do that at the same time. I think we are seeing more and more examples of that being very possible, and I think that is actually always the most important element in getting something really off the ground. People are only going to try something to the masses anyway if it is also economically [viable] [...] Where impact is one of the topics that is always included in it as standard.'

However, some ambivalence between this strict focus on societal impact on the one hand and being part of a traditional finance system on the other hand makes a soft line between promoting a true frame break or using existing frames as base for a new one through keying:

'We have agreed a washing machine cycle with our financiers, in 30 years it has to be invested a number of times. If a case comes along that you say is a really great opportunity for money multiples, then that is also an argument for us to do that case. It could be that it scores less well on our social challenges but very well on the economic impact.' And *'... sometimes it's hard to quantify it anyway. So that you can properly weigh this against other criteria... sometimes it is unclear. What is impact? And you always have a kind of contradictory impact. For example, economic growth is often in many cases also a burden, for example to the environment, and I think that's a very interesting subject, to make that all a bit more concrete.'*

The concepts of standardization and a common language play a large role for the sustainability integration of the fund. Both participants used the offer for a free comment to suggest metrics and standardization for sustainability as a relevant potential research direction. In different other occasions examples are given on how measuring sustainability and societal impact in a way that could be balanced to finance adds to credibility in decision making and integration of the topic in general.

On the contrary, could be said, it seems that generally the company learns by doing and is dependent on built up experience and gut feeling, as is also linked to how sustainability knowledge and decisions are partly underpinned, a sign of situated improvising as framing mechanism. In addition, there are traces of keying with regards to the role that VC and technology play in sustainable development. In one comment the potential of capital allocation with government interventions, being able to steer direction of innovation:

'So ultimately by making more capital go to the initiatives that contribute to impact, than to those that have negative contribution or no contribution. And ultimately you steer behavior indirectly this way because companies can't grow without capital. And if you allocate your capital in the right direction, you actually stimulate that as well, similar to the government.'

In another comment the evident link between sustainability and technology is made through their link to commodity management and how VC is the only way to get to the point that such innovative companies can compete with incumbent market players.

'Sustainability is almost always about technology. So it's almost always about commodities. Let me take the example of Carbyon again: CO2 is a commodity. So it's extremely difficult to enter the market with that, it takes you a tremendous amount of capital before you're to the point where you can compete with existing institutions. So sustainability is quite often about competing with large parties so that also requires a lot of capital.'

4.4.3 CONCLUSION: FRAME INSTITUTIONALIZATION PATTERN

To start, the fact that the fund is not so much questioning the traditional finance system might be because their principal investor is the regional government, who do have profit expectations but on a much longer time scale (30 years compared to 10). In addition, this main LP has as main goal regional development, which they nowadays frame in the context of societal challenges and the SDGs. The fund does challenge the legitimacy of the pricing of commodities that influence the development process and the amount of capital needed for deep-tech innovation. As they see sustainability is mostly about new technologies, they see the same challenge for sustainable innovation. The fund differentiates itself from traditional VCs as they invest in a very early stage to bridge the gap between technology development

and market validation. In a way, they are manipulating the incumbent market themselves by investing in technologies that private investors would not invest in, which could be seen as an action of frame break of VCs' role in society to promote actual disruptive innovation. This fund is also active in merging the frames of making a profitable investment and a sustainable investment, considering such a decision is now mutually inclusive as both depend on scalability. The fund is currently professionalizing impact reporting of the investments and trialing KPI instead of profit-focused investment departments. This could be helpful towards their questions related to balancing between impact and profit, what is substantial impact and how they can coach a business to be more sustainable. In essence a way of merging the VC tools and benefits to that of societal impact. In conclusion, this fund is on de verge of moral duty 'revolution' (A) and opportunistic 'evolution' (C) frame institutionalization patterns.

4.5 CASE STUDY 5: HIGHTECHXL

Backed up by the Eindhoven Startup Alliance, consisting of ASML, Philips, TNO and BOM, HighTechXL builds deep tech ventures at the High Tech Campus in Eindhoven. In exchange for equity, the company guides the startups through a venture-building program including a very early-stage financial investment. This is not a traditional VC model; however, the company is closing a 20 million deep tech seed fund over summer with different LPs to support the venture-building efforts with serious VC capabilities. Therefore, the case is considered relevant for the research question.

HighTechXL collaborates with knowledge and research institutes such as CERN, ESA and TNO to put societal value and use to patents that are not used outside their original research contexts. As this is part of their core business, it aligns with the fact as part of the mission and vision of the company, societal challenges play a large role:

'We build deep-tech ventures that address grand societal challenges. We truly believe anyone with the ambition to improve the lives of others deserves the opportunity to become an entrepreneur. We are passionate about sustainability'

However further website content is mostly centered around venture-building for regional development and deep tech innovation, as aligns with the main goals of the Eindhoven Startup Alliance.

The fund is concerned with ventures that did not exist before entering the program, which is why they have a relatively large influence on team- and business development and other crucial elements to get a startup investor ready. Instead of startup scouting, core activities are therefore scouting and selecting promising entrepreneurs and technologies, as well as executing a program that brings these two together.

According to the employee, sustainability and societal impact is part of the companies DNA and embedded in venture coaching tools. Before entering the program, the startup must be able to explain which SDG they tackle with their innovation, as a way of elaborating their societal impact. This is administrated by making every potential co-founder sign a collaboration agreement that also consists of a sustainability annex. Throughout the program the startups must give these societal impact statements substance with quantification or in-depth qualification. All ventures in the company's new way of venture-building have an explicit link to at least one SDG. In addition, societal impact is measured through ecosystem impact, which is mostly measured through added jobs, patents and diversity of team.

With regards to responsible business operations, the company is embedding this in the program, but finds it challenging to really implement these practices in the very young startups. In constructing the newest fund, the company is very conscious about selecting LPs that are aligned with their sustainability and societal impact mission, to make sure that in the future these stakeholders will support and not slack efforts in increasing responsible business metric reporting and management.

4.5.1 FIELD CONDITIONS

The interview consisted of twelve moments where current field legitimacy was challenged, mainly related to the misalignment and contradictions between the current capitalistic economic system and a sustainable future.

'Of course, we are a capitalist system, but then I think you make the planet less livable for future generations. And of course, you won't notice anything of that yourself, but that's just the contradiction there [...] But I think the market is also changing more and more... becoming more sustainable eventually. It's becoming more and more important. And hopefully that at some point in your valuation sum you don't just have more financial motivations. Not just have financial variables. That perhaps a sustainability variable will be included at some point.'

In addition, the employee sees many challenges arising from the way society is build up and how that is slowing down the transition, as many conservative companies, processes and institutions will break down completely when transition goes too fast. This argument is repeated and applied on the financial sector, where the employee gives an example of the ambivalence in purpose of pension funds:

'The financial return of ABP ... is 21%. ROI is their main driver and the only way they don't have to eventually cut the pensions of the Dutch people who are no longer working. But that means that if they make a new investment, it will have to meet that benchmark ... because they can't go to the group of 80-year-olds and say "you get 100 euros a month less - oh but we happen to have created a better society in 40 years."'

Although people increasingly consider sustainability a value driver, when related to finance too often it is seen as a cost instead. This is a learning from the process of raising a new fund, where different potential LPs showed an initial interest in sustainable projects as an added value, however, are quickly to move this topic to the list of costs. At HighTechXL the team spends time to understand how to mobilize and leverage sustainability as value driver.

'And that's why I think it's a value driver because it makes a company more sustainable and a more sustainable company should mean it's worth more'

To the frustration of the employee even in HightechXL sustainability and corporate responsibility on some occasions still gets overruled by financial return when the need is high, for example to avoid bankruptcy of a startup. The related example is about implementing technology for frontline army technology.

'There's not even a mention of sustainability there anymore then... That simply has to do with the fact that the company will potentially go bankrupt within three months. Except if they can run these kinds of pilots and of course there's money in it from us but also from others investor and that's what has to be earned back. And it also makes it possible that they can eventually do more sustainable projects. But really from a sustainability point of view you should ask yourself: do you want this?'

The recent introduction of the EU Sustainable Finance Disclosure Regulation (SFDR) will enhance sustainability practices of investors; however, the employee concludes that without intrinsic motivation towards investing with a different purpose, this is still just superficial.

4.5.2 FRAMING MECHANISMS

In explaining the responsibilities as portfolio manager, which he described from the perspective of the HightechXL business model that is like investment companies, some traces of maintaining frame dominance were observed:

‘My job as a portfolio manager is to manage the piece of share that we have in all the companies, to create additional value in that and to ultimately generate the best possible exit from a financial point of view but of course also from a more strategic ecosystem point of view to create as many jobs as possible and bring as much money as possible this way [...] Because ultimately our business model is focused on giving money back to our investors.’

Although this financial perspective is emphasized on different other occasions, this is the only time as stand-alone argumentation. Looking at some quotations linked to the framing mechanism of maintaining ambiguity, the economic focus in some situations gets a pass at a cost of sustainability. Although societal impact is part of the core business, still in financial emergency situations, such as a potential bankruptcy of a portfolio company, ethical stands have been moved aside. And in the process of setting up a new VC fund, for long the suggestion was to comply to the lowest SFDR standard so it will never cause financial risk if the company cannot uphold related promises. Later informal conversations with the company managing partner and the portfolio manager have evidenced a change in stance towards this, influenced by potential investors and internal conversations about the value of taking up the challenge.

‘With the SFDR articles 6 to 9, that immediately the first thing that was shouted is: go for the lowest article compliance as you can, so should things get difficult you do not cut yourself in the fingers.’

Although it is difficult to leave the traditional financial stance for VC because they rely still on partners that remain to have that focus, the company also finds reasons to believe that this traditional VC model can work for sustainable innovation when some parameters are added in a process of merging frames. The employee sees a need for sustainability to be part of the formal valuation process to really make it part of every decision, using Triodos Bank and ASN to exemplify that sustainability can be part of the balance sheet whilst making profits. More information to support sustainability-based decisions and more regulation would support the transition. When properly integrated, economic benefits of corporate sustainability will accelerate this transition even more.

An important frame break is based on the believe that sustainability and technological innovation are inherently linked, as it seems for three reasons. First, the interviewee concludes that in the current state of the planet any technology or innovation should be sustainable to avoid harm to future generations. Secondly, deep tech is part of the solutions we need for sustainable development, also emphasized by public communication the company, the employee sees an explicit role for deep tech compared to soft tech:

‘[technology plays a role in sustainable development] on the one hand by reducing as much as possible the damage that we have done and on the other hand I think by preventing new damage [...] In fact, I even think that technology is the only form how we can make the planet sustainable again ... You can't take CO2 out of the air with an application. And hardware is controlled by software, but with just a software – controlling the moves of a dam - you don't

get anywhere. You actually have to build the dam. So I think that hardware technology is indeed the key to getting to that point and, in addition, you also have to include people in the change management story. But I see that rather as a subordinate of the technology.”

He furthermore observes that the most successful ventures that were built in the program also have the most explicit link to sustainability. Thirdly, he links the development time of real sustainability transformations and deep tech solutions and how that makes the choice for societal impact solutions very aligned with the deep tech focus of the fund. For this early-stage innovation, the role of venture capital is seen as the driving power. He explains:

‘Because there are also great opportunities [in sustainability], and I think what I’m saying is that it’s in our DNA to go for that sustainable option. Plus, we’re working with very early-stage companies that are not going to become mid-sized companies until 6 to 8 years. So you’re already at the forefront of innovation instead of infrastructure that is currently the dominant design., and before our Carbyon will be dominant design we’re talking 40-50 years from now [...] And I think that the role of venture capital in society is to give early stage companies that are innovative - so often go faster but also fail faster - in that higher investment risk, precisely those young companies, the chance to indeed create something disruptive ... for example, in the context of sustainability, to give new sustainable initiatives within existing and new markets the chance to create something that benefits society, that benefits the planet..’

In contrast to previous traces of keying sustainability and the economic context into one frame, there is also signs of giving the economic context a second place. Societal impact is part of the DNA of the company and strategic decisions such as collaborations with LPs and potential partners are informed by that DNA. When asking why the company exists, the first explanation is ecosystem impact through regional growth, secondly comes the societal impact through building ventures that have the SDGs linked to their core business.

4.5.3 CONCLUSION: FRAME INSTITUTIONALIZATION PATTERN

While raising money for their own deep tech seed fund, the organization has experienced the change of field legitimacy towards sustainable investment in real-time. The focus on societal impact framed by the SDGs turned from a costly burden into a differentiating edge. The company itself has always existed to turn deep tech into societal impact solutions. Processes of internal reframing refer to societal impact as part of the company DNA and the inherent link between very early-stage innovation and disruptive innovation for a longer timescale. In addition, they position deep tech (hardware) as particularly relevant for sustainable development compared to soft tech (apps). Due to the nature of the fund being an accelerator, they are always trying to find ways to integrate topics like sustainability and societal impact in the more extensive journey of building a business. Adding societal impact KPIs to the startup balance sheets as part of the structured venture-building program could be one of the ways that the company is trying to change the traditional investment market. This fund is assessed as moral duty ‘revolution’ (A), although it does show characteristics of the opportunistic ‘evolution’ (C) frame institutionalization pattern.

5 CONCLUSION OF SUSTAINABILITY MAINSTREAMING IN DEEP TECH VCS

In this chapter, the intent is to find an answer to the main research question ‘*What frame institutionalization patterns for sustainable investment are prominent in the deep tech venture capital industry?*’ based on the results presented in chapter 4. In addition to positioning the

cases individually on the matrix, this chapter presents the most relevant insights from a cross-case study analysis in relation to theory and finishes on the weight of sustainability in investment decisions.

5.1 FRAME INSTITUTIONALIZATION PATTERNS IN TECHNOLOGY FOCUSED VCS

The case studies show that the frame institutionalization patterns based on Gray, Purdy & Ansari (2015), which support an increase in the adoption of sustainable investment, are visible in deep tech VC funds. The results support the conclusion that deep tech VC funds are generally transforming the frame of sustainability in their field with an opportunistic approach, also recognized as the evolution pattern. Figure 10 shows the position of the case studies on the matrix of frame institutionalization patterns.

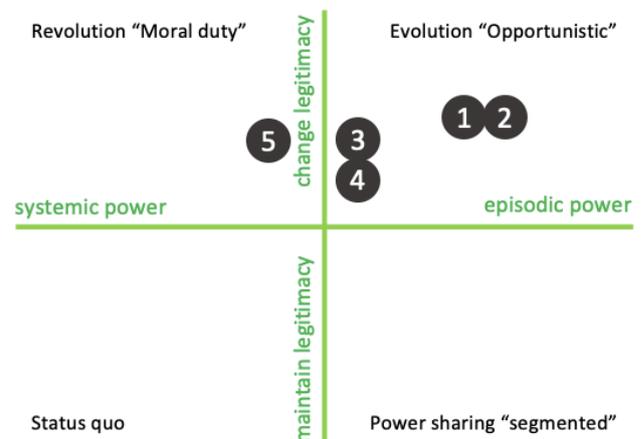


FIGURE 10 THE POSITION OF DUTCH DEEP TECH VC FUNDS ON THE FRAME INSTITUTIONALIZATION PATTERN MATRIX

Field conditions in deep tech venture capital

All funds are contesting field legitimacy. All case studies evidence traces of the desire to change the legitimacy of the current economic frame and the role of capital, as observed by, e.g., GIIN (2018) and Dumas & Louche (2016). The main reasons are because (a) it harms live-able conditions for current and future generations and the planet, (b) it does not consider negative social and environmental externalities, which also (c) constraints genuine disruptive innovations by benefiting incumbent companies through this market failure and (d) causing many existing processes, institutions, and companies to break down completely when subject to a revolutionary societal transition. Almost all interviewees showed an emotional connection to sustainable development and societal impact, whether through frustration for the bad choices or passion for the good choices. In line with the study by Dumas & Louche (2016), these investors are slowly adapting their belief on what a good and functional market consists of, and they observe the limitations of not having full adoption of this new collective belief that gives value to sustainability.

The perception of power moves between systemic and episodic power. The perceived issues related to dominant power structures are primarily associated with the economic system and how markets currently work and influence innovation. Although the VCs confirm that they see their investment in breakthrough technologies as an adequate response to market failure (e.g., Dean & McMullen, 2007; York & Venkataraman, 2010), lobbying, investments and regulation that support the incumbent non-sustainable sector are still frustrating innovation. In some cases, the significant financial pressure that institutional investors like pension funds have towards their clients (and society) is recognized as a troublesome balance act that LPs at this point still must uphold. General pressure on ROI from LPs is powerful as well, however as an asset manager, funds position themselves instead as the change agent with room to

maneuver and control over the degree of sustainability of the startup/investment (e.g., DNB, 2018).

Frame mechanisms in deep tech VC funds

In line with the theorized patterns of evolution and revolution (Gray et al., 2015), the dominant framing mechanisms in all funds were frame break and keying. Several observations in framing mechanisms demonstrate this, as discussed in the following paragraphs.

Throughout the case studies, different examples show that these pioneer investors genuinely believe that a future-proof business model can only be that when it considers sustainability risks, both imposed on the companies as on the planet and society – aligned with DNB (2018) categorization of sustainable investment. In the future, this might mean a complete integration of ESG factors in the balance sheet and critical roles for new jobs such as ‘life cycle engineers.’ Although this scenario is considered utopic for most interviewees, four out of five cases are already trying to merge corporate sustainability practices with the traditional VC frame, where return on investment is critical – also on this new topic. They do this by (a) adopting standardized ESG and corporate sustainability practices on the integration level that makes sense for startups and (b) find ways of reporting and monitoring this as part of the due diligence process and portfolio management, through e.g. hiring consultancies on impact management, hire internal ESG and impact officers, and conducting and discussing LCAs. They also (c) add societal impact as investment selection criterium next to technological uniqueness and market opportunity; some go so far as identifying sustainability and societal impact as the only license to operate and thus in complete self-interest of an investor to include it.

The funds frame this societal impact like Chatzitheodorou et al. (2019) describe investments in the socio- and environmental domain: delivering solutions to global social and environmental challenges. Triodos (2018) also emphasized this perspective on investing as contributing to a sustainable society rather than only avoiding harm. The funds agree to identify impact through the context of the SDGs, which can be considered a master frame adopted more widely in society (GIIN, 2018). Some specifically stated that sustainability and impact in technology should not only be defined by the definition of ‘clean tech’ but also include social goals and impact. Measuring return on investment on impact appears to be more complex for social topics than environmental topics. Although literature such as Dumas & Louche (2016), DNB (2018) and GIIN (2018) confirm the lack of standardized reporting and managing is an issue, they do not distinguish between social and environmental parameters.

The funds are exercising some caution in actively endorsing these new sustainability stories to partners and stakeholders, as it appears that there is still currently a discrepancy between what the funds want to report and what they do. One case said they might comply with a lower-level sustainability regulation to avoid getting in trouble if they fail the highest regulation. Another fund is internally working on integrating these new practices but currently avoids ‘waking up’ stakeholders with promises they cannot uphold yet. In line with Dumas & Louche (2016) and DNB (2018), it is observed that the concepts of sustainability and societal impact are currently defined rather black and white and lack clarity. This makes investors avoid active involvement, even if small steps in ESG or sustainability management of the assets are made.

One frame-break gets amplified through processes linked to importing a master frame (see SDGs previously) and internal reframing (Gray et al., 2015) and is supported by all funds: the

inherent and deep-rooted connection between deep tech innovation and sustainability. This study identifies four streams of thought, first (a) true societal impact is dependent on disruptive innovation, which relies on groundbreaking deep hardware technologies. All case studies show a strong focus on technology as a key enabler for change, still in two case studies technology is put next to behavioral and regulatory change. Secondly, (b) technological innovations and sustainability challenges are often about commodity management and physical resources, such as carbon dioxide or plastics. Both require long-term development and high capital investments to compete with incumbent and dominant markets, as also recognized by Gaddy et al. (2017) and Elkington (2021).

Consequently, (c) sustainable and deep tech innovation have a similar risk pattern due to their relation to the future, only becoming 'dominant design' after decades and needing long-term investment strategies. Interviewees use strong definitions like 'paradigm shift' and 'investing in the future' to explain their focus on the long term. This makes that (d) they are both often mistakenly compared to later-stage investments causing a misleading gap in the valuation of potential impact, while these investments should be considered very early stage where risks are higher, but potential ROI is also higher. A narrative that resonates throughout all case studies is that high-tech innovation is only groundbreaking when it is also sustainable.

Finally, this study reveals a desire to reframe the concept of what an impact investor is. From theory, it already appears that for mainstreaming sustainable investment it is vital to move away from the idea of impact investors as a separate class (e.g., Chatzitheodorou et al. 2019, GIIN, 2018) which is emphasized through the results of these case studies. All funds communicate societal impact as the core of the business, however, they are still finance first focused to their LPs. Four out of five funds do not rank themselves as 'impact funds' to avoid confusion that they might have lower financial returns. They actively involved in sharing different narratives of what an impact fund is, most notably (a) societal impact is no longer a 'geiten wollen sokken' charity activity instead it is a real business asset, (b) impact is not a binary qualification as it can have different levels of intensity and integration, in line with degrees of sustainability (DNB, 2018) and (c) impact can be part of the DNA and strategy of a fund that uses financial profits to reach that point.

In addition, the three regional-focused funds add a level of ecosystem impact to their societal impact qualification. Regional and economic growth and an increased and more diverse job market are added indicators of societal impact beyond the SDGs.

To conclude, behavior and streams of thought found in the case studies correspond best with the framing institutionalization patterns of evolution and revolution (Gray et al., 2015). All participants and funds show involvement in changing the way of framing sustainability in their investment context, none of them refrain from the process. Some are more active and personally involved in the narrative of sustainable development as a moral obligation. They feel the system they are part of needs more extensive changes than just their transforming investment choices. Others adopt the business sensibility and moral obligation of corporate sustainability by keying in everyday life and work situations, as in the evolution pattern.

5.2 THE RELATIVE IMPORTANCE OF SUSTAINABILITY IN INVESTMENT DECISIONS

Understanding the frames of sustainable investment in deep tech VC funds is relevant only when knowing their effect. The different case studies show that the effective adoption of sustainability as part of the investment decision takes different shapes and happens on different levels.

Generally, the focus of the investment processes described in the interviews had two main themes: technological uniqueness and the market opportunity, thus potential ROI. However, throughout the conversations, it stands out that, in addition to those two characteristics, all funds select their startups and investments for their societal impact, which could be identified as positive screening methods (Chatzitheodorou et al., 2019). In the independent funds, this is initiated mainly by the VC funds and backed up by only a few LPs. In the regional funds, this is initiated by the main LPs that have a responsibility to regional communities and governments. This is oriented on the technological solution that the startup brings and is executed in the following ways:

- Selection on the investment's contribution to the SDGs in general without thematic constraint
- Align fund themes and consequentially investment selection with SDGs
- Use Environment Social and Governance to qualify an investment within ESG themes

The second integration of sustainability is ESG management for day-to-day business processes or the company's 'operations hygiene.' This is conducted from their role as shareholder and strategic business coach for the startups. However, in all situations reporting and managing impact and sustainability is only in the early days of professionalizing and relies primarily on gut-feeling and qualitative analyses.

6 DISCUSSION AND RECOMMENDATIONS

In this final chapter, the researcher reflects on the method, theory, and empirical results and makes suggestions for further study.

The conceptual model was helpful mostly in identifying practices related to changing field norms, as it involves active, observable, and discussable behavior. When signification requires no or little action because there is a wish to maintain current field legitimacy norms, this can show through active resistance or repetition of extant frames, however, it can also be an act of doing nothing (Gray et al., 2015). In some situations, indicators like 'profit maximization' and 'competitiveness' could be observed, however often as part of discussing the value of sustainability-related topics, eventually linking them to the revolution and evolution pattern. As such, it turned out to be easier to identify processes and perspectives that are in a transforming context, so it should be considered that actions related to maintaining the status quo and power-sharing might not have been identified while they were there.

Conform the conceptual model, it appears two general streams of giving meaning to the new sustainable investment frame exist: one that wants to gradually integrate sustainability in the current economic model (evolution) and one that moves from a moral standpoint towards giving a different meaning to that entire economic model (revolution). However, on the organizational level, the processes were not distinct between one or another. Differences occurred between different employees, as well as within the meaning giving of an individual employee or company.

Defining power relations in the market was not always straightforward, which does in a way relate to the position of VC funds: under financial pressure from LPs and as guardian towards startups, deciding which innovation gets a chance to fly and which does not. In a way funds simultaneously break frames concerning their innovation focus and investment thesis while they are keying towards those stakeholders still stuck in that old financial profit-based model.

Content-wise, the case studies deviated from the model by emphasizing technological innovation over traditional financial topics. From theoretical application, it was expected VCs are finance-focused organizations, while in the empirical case studies, the deep tech VCs framed themselves from a technological innovation perspective.

This study gives new insights into how the specific characteristics of the deep tech VC sector create different dynamics in adopting the sustainable investment thesis. Recent developments such as the Shell Klimaatzaak (Mommers, 2021), the introduction of the SFDR (AFM, 2021), and an updated Green New Deal have not found a place in this research yet. Still, all three developments request a great deal in response from the high-tech innovation and investment sector. Understanding how the involved stakeholders, such as VC funds, give meaning to their position in sustainable development helps in involving them for even more impact.

Future research could be conducted to identify the roles of individuals in such organizations that are typically small and work together closely. Researching how innovative technology implementation is blocked by market manipulation and incumbent organizations and regulation can be valuable. In addition, corporate sustainability benchmarks adjusted to the early development stage of young technology startups can help implement sustainability practices, for example, through panel discussions with industry experts. In the summer of 2021, two pioneering Dutch pension funds sold all fossil assets. It would be an addition to this study to understand if that boosts the request for sustainable technology VC investments.

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APPENDIX 1 INTERVIEW GUIDE

Algemeen

- Kan je omschrijven wat [investeringsfonds] doet?
- Wat doe jij bij [investeringsfonds], waarom ben je dit werk gaan doen?
- Wat is de reden dat dit fund bestaat? Wat zou er niet kunnen zonder jullie?
- Wat voor soort bedrijven zitten er in jullie portfolio?
 - o Wat zijn de laatste twee investeringen die jullie hebben gedaan?
 - o Waarom hebben jullie in die startups geïnvesteerd?
- Kan je omschrijven hoe een investeringsbeslissing tot stand komt in jullie organisatie?
 - o Op basis waarvan bepalen jullie of je een investering maakt?
 - Criteria, onderbuikgevoel, financieel gestuurd
 - Wat zijn in het contact met de startups triggers?
 - o Wie speelt er allemaal een rol bij een investeringsbeslissing?
 - Op welke manier hebben LPs/investors hier invloed op?
 - o Op welke momenten in dit proces speelt vrije interpretatie van de portfolio manager/partner/beslisser een rol?

Theory based

- Wat betekent duurzaamheid voor jou? Waarom?
- Welke rol speelt technologie in het duurzaamheidsvraagstuk?
- Welke rol spelen jullie (VC funds) in dat vraagstuk?
- Hoe komt dat tot uiting?
 - o Op welke manier passen jullie duurzaamheid toe?
 - o Is jullie visie op duurzaamheid in de afgelopen tijd veranderd? Hoe komt dat?
 - o Welke praktische processen zijn hieraan verbonden?
 - o Hoe ligt dit vast?
 - o Wanneer zijn hiermee jullie begonnen?
 - o Waarom doen jullie dit zo?
 - o Wordt de visie op duurzaamheid organisatie breed gedragen tov individueel?
 - o Is de visie op duurzaamheid bespreekbaar binnen de organisatie?
- Wat voor externe invloed ervaren jullie op het thema duurzaamheid? (bv. LPs, overheid, startups, media etc.)
 - o Welke partijen?
 - o Kan je voorbeelden noemen van contact met [startups/investeerdere] die jullie beoordeling tov duurzaamheid hebben veranderd?
 - o Ervaren jullie druk van buitenaf met betrekking tot duurzaamheid? Welke druk?
 - o Wat is de invloed van het veld waarin jullie opereren? Ervaren jullie hieruit beperkingen? Is er ruimte voor beweging/een andere richting?
 - o Is de huidige markt geschikt voor een duurzame manier van investeren? Waarom? Moet er iets veranderen?
- Waar lopen jullie tegenaan met betrekking tot duurzaamheid in investeringen? Waarom?

Specifiek voor ESG officer:

- Kan je uitleggen hoe jullie [rapport] gebruiken?
- Wat zijn uitdagingen van jouw werk bij dit fund?
- Waarom zijn dit uitdagingen?