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# Venture Capital Funds and Cleantech Startups

How do Norwegian venture capital funds use  
their human and social capital when adding  
value to their cleantech investments?

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## **Preface**

This is a master's thesis by two students enrolled at the Norwegian University of Science and Technology (NTNU), undertaking a master's degree in Industrial Economics and Technology Management within the field of Innovation and Entrepreneurship. The research was carried out in the Spring of 2018, from January to June. The purpose of this thesis was to understand how Norwegian VC funds can be more successful when investing in cleantech, building on how venture capitalists add value to enhance their portfolio companies, in general and through human and social capital in particular.

The authors would like to thank their supervisor, Associate Professor Øyvind Bjørgum from NTNU, who has been helpful providing valuable guidance, support and feedback throughout the semester. This has been very much appreciated. Further, the authors would like to thank their co-supervisor, PhD Candidate Puck Hegeman, from NTNU, for introducing the authors to this interesting topic, and also giving advice and feedback in the process of planning and conducting the research. Lastly, the authors would like to express their gratitude towards the VC funds participating as case studies for this thesis, contributing with their experiences and knowledge from investing in cleantech startups.



## Abstract

In Norway “the green change” is on the agenda to develop new solutions that eventually can solve the world’s sustainability challenges. To achieve this, cleantech startups play an important role, as they often are the ones to initiate the sustainability-transformation of established industries. Cleantech startups are typically dependent on venture capital (VC) to succeed, as they are often too risky to obtain traditional funding and are dependent on VC funding and additional value added. There is a vast amount of literature on VC funds’ value added, as well as their investment model. However, the string of literature connecting VC funds and value added to the cleantech context is very limited. The literature further shows that human and social capital both have a large impact on the performance of VC funds in general, but that there is a gap when it comes to research in a cleantech context. Thus, the purpose of this master thesis is *to identify how Norwegian VC funds add value to their cleantech investments, and which aspects of human and social capital they draw upon to create this added value.*

Qualitative case studies have been carried out, with five Norwegian VC funds serving as case companies. Empirical data has been collected through semi-structured interviews, then analysed using an abductive approach and a framework created by the authors based on existing theory. The framework allows for a detailed, two layered analysis, encompassing the complexity of the paper’s research questions, while also providing structured and consistent results.

The findings show that the most important value adding inputs for Norwegian VC funds investing in cleantech were; outreach, recruitment, strategizing and consulting. Bridging social capital and industry specific human capital have the highest importance across all value adding inputs. However, there seem to be a gap between how much industry specific human capital Norwegian VC funds have, and how much is needed to invest successfully in the cleantech industry. Outreach is particularly reliant on social capital, recruiting on bridging social capital, strategizing on industry specific human capital and bridging social capital, and consulting on industry specific human capital. Funds lacking industry specific human capital typically hired external consultants to conduct consulting activities. Additionally, it was identified that mandating, although not focused on by Norwegian VC funds today, could have a significant contribution for the development of cleantech startups, and that this activity is particularly dependent on human capital to be conducted efficiently.



## Sammendrag

Det “grønne skiftet” er satt på agendaen i Norge for å utvikle nye løsninger som forhåpentligvis kan løse verdens klimautfordringer. For å klare dette er man avhengig av oppstartsbedrifter innen ren teknologi, ettersom de er mer tilbøyelige til å gripe muligheter innenfor bærekraft enn etablerte bedrifter, og dermed spiller en viktig rolle i å utvikle et grønnere samfunn. Oppstartsbedrifter er avhengige av venturekapital for å lykkes, ettersom de ofte er for risikofylte til å få bevilget tradisjonell finansiering, og venturefond bidrar med både verdifull finansiering og ikke-finansielle bidrag. Det finnes mye litteratur på hvordan venturefond utvikler selskapene sine gjennom ikke-finansielle bidrag, samt deres investeringsmodell. Det finnes derimot lite forskning som knytter dette feltet opp mot en ren teknologi-kontekst. Videre viser forskning at menneskelig og sosial kapital påvirker venturefonds prestasjoner, men det mangler slik forskning i kontekst av ren teknologi. Dermed har denne masteroppgaven som hensikt å *identifisere hvordan norske venturefond tilfører ikke-finansiell verdi til deres investeringer innen ren teknologi, og hvilke faktorer av menneskelig og sosial kapital som brukes når de gir disse bidragene.*

En kvalitativ metode har blitt brukt, med case studier av fem venturefond. Empirisk data er samlet inn gjennom semi-strukturerte intervju, og deretter analysert med en abduktiv tilnærming, gjennom et teoretisk rammeverk konstruert på bakgrunn av eksisterende forskning. Rammeverk tilrettelegger for en kompleks, to-lags analyse, som tar høyde for forskningsspørsmålenes kompleksitet, samtidig som det gir strukturerte resultater.

Funnene viser at de viktigste måtene norske venturefond bidrar til utvikling av investeringene sine innen ren teknologi er gjennom å nå ut til viktige aktører, rekruttering, strategiutvikling og konsultering. Brobyggende sosial kapital og industrispesifikk menneskelig kapital ser ut til å være viktigst for alle ikke-finansielle bidrag. For å nå ut til viktige aktører brukes sosial kapital, rekruttering bruker brobyggende sosial kapital, strategi bruker både industrispesifikk menneskelig kapital og sosial kapital, og konsultering bruker industrispesifikk menneskelig kapital. VC fondene som manglet sistnevnte selv, leide vanligvis inn eksterne konsulenter. I tillegg fant man at mandat-aktiviteter var lite i fokus hos norske venturefond, men er noe de burde fokusere mer på for å utvikle investeringer innen ren teknologi i fremtiden. Dette bidraget var spesielt avhengig av menneskelig kapital for å utføres effektivt.

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# 1 Introduction

This chapter gives an introduction to the master's thesis, beginning with the motivation behind the chosen topic, then presenting the purpose and research questions. Further, the contributions will be described, and lastly the structure of the thesis will be presented.

## 1.1 Why venture capital funds and cleantech startups

Global climate change and the accelerating depletion of natural resources are just two of several phenomena showing that the world has deviated from the path of sustainable development (Brundtland, 1987). In recent years, more and more policymakers are recognizing that these sustainability challenges are urgent problems that the world needs to tackle (Wüstenhagen and Teppo, 2006), resulting in an increased awareness that incremental steps will not be enough to prevent the continuing depletion of natural capital (Delmas et al., 2007). This awareness is also present in Norway, as the “green change” is high on the agenda with more companies taking social responsibility to find better and more sustainable solutions (Ribu, 2017). The United Nation's Framework Convention on Climate Change has further set a goal of limiting temperature increase to 1.5°C, and in order to support the probability of reaching this goal, the world is dependent on developing new energy technologies in the close future (Caldeira et al., 2003).

Seeing that cleantech startups can be defined as companies which “commercialize clean energy technologies or business models (Gaddy et al., 2017), they are ideal for creating solutions that can contribute to solving the world's sustainability challenge. Further, research shows that in the early stages of an industry's sustainability transformation, new entrants are more likely than large, established firms to pursue sustainability-related opportunities (Hockerts and Wüstenhagen, 2010). Attracted by the early market success of new ventures, larger firms then follow up with corporate sustainability entrepreneurship initiatives of their own (Hockerts and Wüstenhagen, 2010). Because of their complementary skills and challenges with regards to sustainable entrepreneurship, a co-evolution of new ventures and established forms is more likely to result in sustainability than either of the two alone (Hockerts and Wüstenhagen, 2010). Thus, cleantech startups play an important role in the sustainability transformation of our society today, and hence also a key role in solving the climate change issue.

Since new technology based startups involve too much risk to get traditional debt financing from banks, they are dependent on venture capital (VC) to grow and succeed (Nanda, 2010). Active VC funds aim to increase the value of their investments by carrying out value adding which involves an ongoing servicing for the startup (Mitter and Kraus, 2011). Thus, the value added from VC funds impacts the success of the startup. Further, in the development of such investments, the human capital of venture capitalists is of great importance (Mitter and Kraus, 2011) and their social capital can positively affect additional funding for the startup (Alexy et al., 2012). Hence, the human resources of VC funds can be essential for the success of their investments.

Over the last ten years, VC investment in cleantech first experienced a period of significant growth, which later diminished after several failed projects. In the years from 2004 to 2008, VC investment in cleantech increased with an average annual growth rate of 47% (Mills, 2015). After 2008, funding acutely declined, and the number of early-stage investments and the funding into those companies has remained low (Gaddy et al., 2017). Analysis show that clean energy technologies underperformed at the time, proving to be both riskier and also offering lower returns than other sectors. However, other results point towards the fact that cleantech underperformance was driven by the poor performance of investments in deep technology innovations in general (Gaddy et al., 2017). Either way, investors responded to this underperformance by shifting their investments to software and software appliances, which are both less capital-intensive and offer greater opportunities for growth (Gaddy et al., 2017). Recent experiences from VC investors describe that the returns from the cleantech sector has still not met expectations, particularly compared to investments in other industries, which continues to make fundraising difficult today (Migendt et al., 2017). As cleantech startups are essential in tackling global climate change, and they in turn are dependent on funding from VCs, research into this field can be of great value.

## **1.2 Purpose of study**

The purpose of this master thesis is to investigate how Norwegian VC funds add value in general, as well as through human and social capital to their cleantech investments. Through gaining insights from experienced Norwegian venture capitalists, the authors aim to discover which value adding inputs the VC funds provide, and how the funds utilize their human and social capital in this work. The objective is to discover whether cleantech investments need a different kind of value added than investments in other sectors, and if certain types of human

and social capital could be of more importance for cleantech investments. Thus, the goal is to discover ways that Norwegian VC funds can be more successful when adding value to their cleantech investments in the future. This way, VC funds will be able to better create business development of cleantech ventures, resulting in overall growth in the cleantech sector.

### **1.3 Research questions**

The research questions are defined based on the paper's purpose, and consequently acts as a decomposition of the purpose. To get a better understanding of how VC funds add value, as well as important considerations when investing in cleantech startups, the authors will address the following research questions:

*RQ1) How do Norwegian VC funds add value to create business development in their cleantech investments?*

*RQ2) How do Norwegian VC funds utilize their human and social capital when adding value to their cleantech investments?*

*RQ3) How do human and social capital impact the most important value adding categories in a cleantech context?*

Through research question one (RQ1) the authors will investigate which value adding inputs Norwegian VC funds carry out when investing in cleantech startups and try to understand how they lead to business development. Research question two (RQ2) relates to investigating how Norwegian VC funds utilize their resources in form of human and social capital to impact this business development. Finally, research question three (RQ3) looks into which combinations of value adding inputs, and human and social capital that has the largest impact on business development of cleantech ventures. These three questions will enable the authors to examine the relationship between value added, human and social capital, and business development in the cleantech sector.

## **1.4 Contributions**

This master thesis will contribute to both the VC and cleantech literature, with the main contribution being towards the intersection between both fields. The mentioned drop in funding highlights the importance of further investigation of the relation between VC and cleantech. Moreover, by answering the research questions the authors will be able to combine knowledge on the VC fund's value added in general and through human and social capital, with how it relates to business development in cleantech startups specifically. The results will help broadening the scope of the somewhat limited literature covering VC funds and investments in cleantech, especially regarding research on value added for cleantech. Further, the research will build on the almost non-existing literature on VC funds' value added through human and social capital in a cleantech context. Hence, this study aims to strengthen this field of research and reduce the mentioned gap. Additionally, it will add a new dimension to the already substantial literature on VC funds and value added by providing research within a specific context, as well as with a particular focus on human and social capital. Lastly, the paper will provide research on the behaviour of Norwegian VC funds specifically, which stands in contrast to the geographical focus of the rest of the VC literature, mainly focusing on Europe and the US. Thus, it will also add to gaps within the VC literature.

## **1.5 Structure of the master's thesis**

In Chapter 2 the authors will present the frame of reference for this thesis, including a literature review on VC funds and cleantech, giving a theoretical background and framework for the study. Chapter 3 will present the methodology used in the study, along with reflections and limitations of the chosen method. Further, Chapter 4 presents an overview of the case companies, short descriptions of the cleantech investments, as well as the empirical findings from the conducted data acquisition. Chapter 5 concerns analysis and results and Chapter 6 discusses the findings in relation to the research questions and existing theory. The master thesis ends with a conclusion in Chapter 7, as well as implications and suggestions for further research in Chapter 8. The authors of the paper will be referred to as the "authors" and are the ones who have conducted the research.

## **2 Frame of reference**

This chapter will present the literature that forms the basis for the development of the theoretical framework used throughout the thesis. The first section introduces VC funds and their investment and business model, as well as literature on their value added in general, and through human and social capital in particular. The second section gives a description of cleantech, in addition to an overview of the literature on venture capital funds in relation to the cleantech sector, which will serve as a context for the framework. In the end of the chapter, the theories presented are combined to create a framework that is suitable for answering the research questions of this thesis.

### **2.1 Venture capital funds**

According to Mitter and Kraus (2011), VC funds can be described as institutional capital providers, traditionally allocating equity in the early seed- and startup-stages of a firm, as well as taking on value adding duties. Denis (2004) refers to VC funds as limited partnerships, with managing partners investing on behalf of limited partners. Thus, VC funds are a professional source of finance alternative to banks, but one that comes with the expense of complete corporate control (Brophy and Shulman, 1992). The importance of VC funding for startups is underlined by how the ability to access capital is one of the main issues faced by entrepreneurial firms, due to low profitability and lack of tangible assets (Denis, 2004).

#### **2.1.1 Investment and business model**

VC funds usually have a limited partnership structure in which the VC fund serve as general partner (GP), and where the limited partners (LPs) typically are institutional investors or wealthy individuals providing most of the capital (Kaplan and Schoar, 2005). The LPs commit to providing a decided amount of capital to the fund, while the GP has an agreed upon period of time to invest it (Kaplan and Schoar, 2005). This time period is typically in the order of five years, and the GP agrees to return the capital to the LPs within a typical time span of 10-12 years. In this investment period, the GP provides capital for the startups usually through staged financing, as it provides incentive for the entrepreneur to achieve required milestones (Mitter and Kraus, 2011). Hence, VCs normally do not provide all the required capital in one go and maintain the opportunity to withhold future cash flow if performance targets are unfulfilled. This acts as a strong incentive for the entrepreneur to align their goals with that of the VC fund (Smolarski and Kut, 2011). The goals of VC funds are mainly

successful exits, such as IPOs or acquisitions, and are often used as a measure of performance (Mitter and Kraus, 2011). VC funds try to achieve these end goals by increasing the value of their invested company. In order to ensure a high return when exiting, VCs provide an ongoing service during the entire investment period (Mitter and Kraus, 2011). The topic of how VC funds add value through servicing their investments will be elaborated on in the next section. The VC business model is summarized in Figure 1 below.

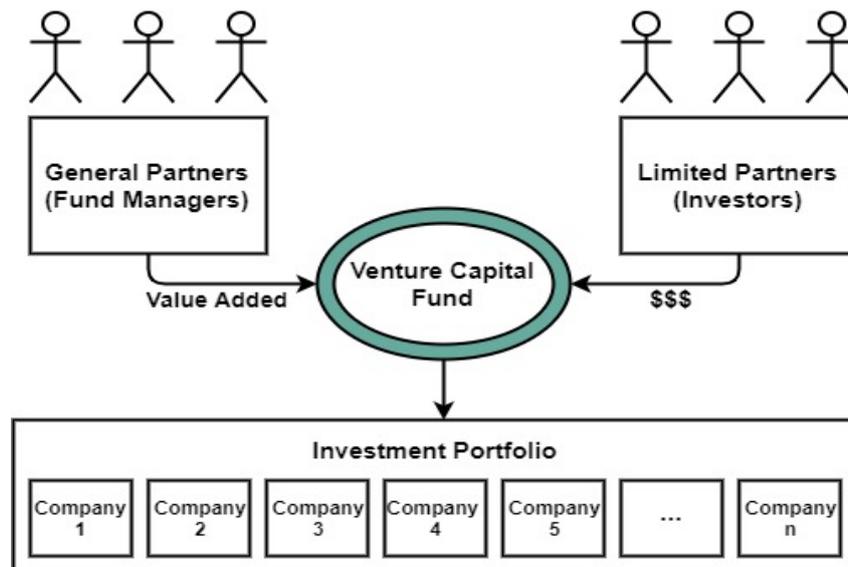


Figure 1: The VC business model

### 2.1.2 Value Added

There is a large difference in how involved VC funds choose to become in their portfolio companies, some choosing a “hands-on” approach, involving themselves more actively, while others choose a “hands-off” approach (Sapienza et al., 1996, Casson and Martin, 2007). For this study the focus has been on venture capitalists choosing a hands-on approach, as the authors are interested in how they add value to their cleantech investments. Added value from the VC funds to their investments is about professionalizing the startup (Hellmann and Puri, 2002). Authors within the existing literature argue that the service and support venture capitalists provide increase the probability of the success of the startup and that it is often associated with efficiency gains and successful exits (Chemmanur et al., 2011). Moreover, several studies have confirmed the positive impact that involvement of VC funds have on their investments (Sapienza, 1992, Sapienza et al., 1996, Casson and Nisar, 2007, Chemmanur et al., 2011, Hellmann and Puri, 2002).

The funds choosing the “hands-on” approach add value to their portfolio through a wide range of value adding inputs. However, there is little consensus when it comes to both which input value added consists of, as well as what the result of it is. Table 1 gives an overview of the different articles that have provided extensive frameworks for VC funds’ value added.

*Table 1: Different categorizations of value adding inputs and activities in the literature*

<b>Gorman and Sahlman (1989)</b>	<b>(Macmillan et al., 1989)</b>	<b>(Large and Muegge, 2008)</b>	<b>(Bjorgum and Sorheim, 2015)</b>	<b>(Proksch et al., 2017)</b>
Help obtaining additional financing	Assistance in obtaining additional financing	Outreach	Investors’ outreach	Financial improvement
Strategic planning	Strategic planning	Strategizing	Business development	Strategic Improvement
Operational planning	Operational planning	Operating	Technology	Operational improvement
Introduction to potential customers and suppliers	Solicitation of essential suppliers and customers	Legitimation	Legitimacy	Support through network
Resolve compensation issues	Replacement of management personnel when appropriate	Mandating		Governance improvement
Management recruitment	Assistance in finding and selecting key management team personnel	Recruiting		Support on human capital issues
		Consulting		
		Mentoring		

As seen in Table 1 above, there exist several different categorizations and wordings to the division of value adding done by VC funds. Gorman and Sahlman (1989) and Macmillan et al. (1989) show similar ways of categorizing the different activities, only with slight differences in wording, and categorization. Macmillan et al. (1989) divide recruiting into;

assistance in *finding and selecting key management team personnel, and replacement of management personnel when appropriate*, while Gorman and Sahlman (1989) merge them into the category *management recruitment*. Also, Gorman and Sahlman (1989) add the category *resolve compensation issues*, which Macmillan et al. (1989) have left out. Large and Muegge (2008)'s framework is built upon 20 studies published between 1986 and 2005 and proposes a provisional eight-category framework for value adding inputs. They have chosen to differentiate between internal and external categories, defining *legitimation* and *outreach* as external, and the rest as internal. Building on the framework presented by Large and Muegge (2008), Bjorgum and Sorheim (2015) also divide their categories between external and internal, defining *legitimacy* and *investor's outreach* as external and *business development* and *technology* as internal. Proksch et al. (2017) build on the frameworks of both Macmillan et al. (1989) and (Large and Muegge, 2008) and chose to split the value adding activities into six categories, but with no definition of internal versus external activities. Additionally, several articles mention examples of value adding inputs and activities, but without providing an in-depth framework; for example, defining strategy development and using their knowledge and contacts to create networks of suppliers and customers, professionals, and other sources of finance (Casson and Martin, 2007), or actively shaping and recruiting management teams for an investment (Kaplan and Stromberg, 2004). Thus, it is evident that there exist several positions and different wordings of what value adding is, and which activities or inputs it consists of.

The literature describes a wide range of value adding activities used by VC funds utilizing the "hands-on" approach. Some activities are researched further in depth than the others, as they are described as the most central sources of value added by the literature, namely; monitoring and advising. A range of studies confirm the role of active monitoring as one of the most central value adding activities (Ehrlich et al., 1994, Denis, 2004, Gorman and Sahlman, 1989). A study by Pomet (2017) found that the quality of venture capitalist monitoring is positively correlated with the survival rates of their investments. Cumming (2010) explains how monitoring and also advising encompasses all interventions by the VC fund into their portfolio startups when the investment has been realized. Further, Cumming (2010) states that monitoring concerns the VCs' control over the actions taken by the entrepreneur, while advisory is more supportive. He also provides a comparison of the efficiency of venture capital advice compared to pure consultant advice, concluding that venture capitalists have a relative advantage when providing business advice due to their higher efficiency. Both

Hellmann and Puri (2002) and Gorman and Sahlman (1989) conducted surveys which found documenting evidence of how VCs both perform monitoring and advising of their investments. Further, Hellmann and Puri (2002) concluded that monitoring is more performed in times of trouble, as to replace the CEO, while advising is more widespread when things go well. The results of Kaplan and Stromberg (2004) both support and complement the results of Hellmann and Puri (2002), confirming monitoring actions in times of poor performance in form of replacing management, and additionally that venture capitalists help founders running and professionalizing the business. Thus, it seems like a large number of studies confirm that monitoring and advising are both important value adding activities, which are considered appropriate for different settings.

Some studies have concluded with which value adding activities that are the most important. Gorman and Sahlman (1989) state that the three most critical services the VC funds provide to their investments in addition to funding are building the investor group, reviewing and support in formulating the business strategy and filling the management team. Large and Muegge (2008) found that the most influential value adding inputs in their study were operating, outreach, consulting, mentoring and recruiting, but adds that evidence is not definitive.

Another stream of the literature is investigating how venture capitalists add value relative to other types of investors. Ehrlich et al. (1994) is one of the earlier studies in this stream, comparing investor involvement in entrepreneurial firms of VC firms versus private investors. Maula et al. (2005) carried out research looking into the importance of various forms of value added from corporate venture capitalists (CVCs) and venture capitalists (VCs), with results being that VC investors seem to better meet the startup's need in obtaining finance, recruitment, competition advice and developing organizational resources, while CVCs can give better technological advice. Dutta and Folta (2016) take a different approach, investigating whether there are differences in value added from venture capitalists and business angels (BAs) with findings showing that VCs' influence on performance or innovation through successful exit is considerably higher. Further, Bjorgum and Sorheim (2015) make a comparison between VCs, BAs and CVCs, studying their contributions on young, technology companies in a pre-commercial and capital-intensive industry. This study's findings coincide with Maula et al. (2005)'s in how their result also highlight how CVC's can

give important contributions in technology development, while VCs seemed to give important contributions in business development.

### **2.1.3 Human & social capital as resources for value added**

#### **Human capital in general**

Human capital theory was first introduced by Theodore Schultz in 1960 (Blaug, 1976). The article was on investments in human capital, in which he stated how “Although it is obvious that people acquire useful skills and knowledge, it is not obvious that these skills and knowledge are a form of capital...” (Schultz, 1961). Further, this article explains the relation between human capital and economic growth, defining human resources to be “... quality components such as skill, knowledge and similar attributes that affect particular human capabilities to do productive work.” Becker (1994) is another important author, who found education and training to be the most important ways of investing in human capital. A more recent work is by Lepak and Snell (1999), in which they present key constructs of human capital theory to involve generic versus specialized skills and the transferability of skills. Moreover, they explain how the uniqueness of a firm’s human capital can be enhanced through team-based production and operational procedures involving social complexity and ambiguity, as this can develop tacit knowledge. In the following paragraph, literature on human capital related to value added will be presented.

#### **Value added in the form of human capital**

One aspect of how VC funds add value to their startups is through using their human capital. In this context, human capital refers to the characteristics of the fund’s general partners or management. These include variables such as type and level of education, as well as the previous working experience of the fund’s general partners (Bottazzi et al., 2008, Dimov and Shepherd, 2005, Zarutskie, 2010).

Mitter and Kraus (2011) investigate whether the identity of investors and their characteristics matter for the performance of the entrepreneurial firm and conclude that the human capital of venture capitalists is of great importance. Furthermore, Casson and Martin (2007) state that one of the most important ways that VC funds add value to their investments is through human capital. Ewens and Rhodes-Kropf (2015) goes as far as to suggest that the VC partners’ human capital is two to five times more important when it comes to explaining performance than the fund’s organizational capital. The findings of Knockaert et al. (2006)

agree with the abovementioned studies, stating that human capital such as previous consulting or entrepreneurial experience is the most important factor. Casson and Nisar (2007) add to this, as their results suggest that active investors entail considerable returns, especially when the investors have important expertise in the areas they invest in. Thus, overall it seems evident that there is widespread agreement of the importance of human capital in value added from VC funds, but with some different opinions of which aspect is the most impactful.

The venture capital context is believed to be particularly suited for studying which aspects of human capital that are associated with higher performance, due to the fact that VC funds possess experiences and knowledge that is both diverse and extensive (Dimov and Shepherd, 2005). The literature divides the concept of human capital into three categories: task specific, industry specific, and general human capital. Dimov and Shepherd (2005) describe general human capital to be the overall education and practical experience of an individual, while specific human capital refers to education and experiences limited to a specific activity or context. Zarutskie (2010) adds that general human capital is defined as skills that can be applied across most firms and settings, while specific human capital can only be applied to a particular time or setting. She also subdivides specific human capital into task, and industry specific, where task specific human capital refers to the human capital that an individual acquires through performing specific tasks, while industry specific human capital refers to experience from a certain job or industry (Zarutskie, 2010). Bottazzi et al. (2008) alternatively name task specific human capital as “job-specific knowledge”, and industry specific human capital as “generic business knowledge”, the latter being measured by looking at previous working experience. Maula et al. (2005) states how “the cumulative experience of the venture capitalists—many of whom have advised dozens of entrepreneurs on the challenges of enterprise formation and early-stage growth—represents a potentially enormously valuable resource.”

Within the string of literature researching general and specific human capital, the researchers seem to agree on the definition of the three subsections, while they have come to different conclusions on how they affect the VC fund. Dimov and Shepherd (2005) conclude that general human capital had a positive correlation with how many portfolio companies managed to get an IPO, while specific human capital did not. However, Dimov and De Clercq (2006) also state that specific human capital lowers the risk of portfolio companies going bankrupt. This was also a finding in a later study by Dimov and De Clercq (2006) which

investigated specialized expertise as an aspect of VC funds' investment strategy and found that the prospect of new venture failure is reduced when the VC fund "brings knowledge relevant to the specific situation of the venture". Dimov and Shepherd (2005) also point out that when conducting strategizing-oriented tasks, one can easier position a company for success if one has the ability to accurately predict and adapt to changes in the company's external environment. The article further draws a connection between this strategizing ability and human capital, by emphasising the value of possessing specific knowledge that is not easy to obtain, as a source of competitive advantage. Bottazzi et al. (2008) conclude that specific human capital makes venture capitalists more likely to recruit new employees and secure new funding for their investments. Further, Zarutskie (2010) claims that industry specific human capital in science and engineering is positively related to performance when the fund specializes in high-tech investments in general. This is also found in the study by Knockaert et al. (2006), which has results showing that specialization in industry focus by the investment manager has a positive impact on value added. Meglio et al. (2017) propose that previous experience in a certain ecosystem matters, as the VCs' coaching capability improves with the number of ventures backed within an industry. The stream highlights that different types of human capital are useful for different settings, focusing on how specific human capital is especially important when investing in high-tech industries.

### **Social capital**

Coleman (1988) introduces the concept of social capital as consisting of several entities, which all have two aspects in common: all consists of some kind of social structure and all promote specific actions from people or corporate actors, who are within the structure. Thus, it is different from other types of capital by how it "inheres in the structure of relations between actors and among actors", and an essential type of social capital is "the potential for information that inheres in social relations" (Coleman, 1988). According to Putnam (1995), social capital includes networks, norms and social trust - aspects of social organization which promote "coordination and cooperation for mutual benefit". Furthermore, social capital is by Nahapiet and Ghoshal (1998) defined as "the sum of the actual and potential resources embedded within, available through, derived from the network of relationships possessed by an individual or social unit". Bonding and bridging are two categories of social capital within the existing literature, and Putnam (2007) defines bonding social capital to be "ties to people who are *like* you in some important way" and bridging social capital to be "ties to people who are *unlike* you in some important way". Usually, a distinction is made between external

bridging social capital and internal bonding social capital, and Adler and Seok-Woo (2002) relate bridging to external relations, while bonding is more about internal ties. These are some of the existing descriptions of social capital, and in the next section literature relating it to value added will be presented.

### **Value added in the form of social capital**

One aspect of how VC funds add value to their startups is through using their social capital. The stream of literature looking in-depth on this field in particular is not substantial, as most researchers do not restrict themselves to only this type of contributor to added value. It seems to be central in several articles, but few are explicitly investigating it. Thus, many merely mention it in short. Meglio et al. (2017) state that VC firms may facilitate necessary resources and capabilities by legitimating and helping them make contact with actors in their own network. Further, Casson and Nisar (2007) state that VC funds add value through network support and creation, but do not go into depth on the topic. However, the mentioned study conducted by Maula et al. (2005), states that the networks of venture capitalists influence their value adding capability. The articles then go further in depth, examining differences between social capital and knowledge in the value added activities conducted by independent VC's and CVC's. Again, the need for more research looking at VC funds' social capital more in-depth and in specific contexts becomes evident.

The field of value added by VC funds to their investments has been widely researched, but there are still some elements which need further investigation. Human capital is stated to be of great importance, and social value can potentially also have a substantial positive impact, but few have specifically investigated the effect these factors have on value adding inputs and activities. In addition, there seem to be a lack of context specific research. In the following sections, cleantech as described by the literature will be presented, including what exists in the cross-section of the fields: value added, human and social capital, related to cleantech.

## **2.2 Cleantech**

The context of this thesis is cleantech, with the motivation behind it described in Chapter 1. In the current literature there exist a range of different definitions for the term, with the majority being broad, including many of the same aspects. One definition by Tierney (2011) defines cleantech companies as companies which generate renewable energy, reduce CO2 emissions, and promote energy efficiency and the conservation of natural resources. Huang (2012) states that the scope of the cleantech term includes renewable energy, green building, energy efficiency, smart power, transportation, green grid, energy storage as well as air, water and waste. Generally, these are companies which strive to protect the environment, through facilitating for the use of clean energy and environmentally friendly solutions (Leo A. Grünfeld, 2011).

The literature describes some central characteristics that particularly affect and define the cleantech industry, relative to other industries. Wustenhagen and Teppo (2006) state that the high risk becomes very visible when comparing the cleantech and information technology industry, where cleantech proves to be both more capital intensive and demands long technology lead times. Ghosh and Nada (2010) add to this by explaining how energy production technologies face technology risks at two stages of their commercialization; first there is the risk of whether the technology is working or not, but then there is also the risk that it might not be scalable. They state that the startups facing this challenge are the ones with the highest risk and the highest capital intensity. Erzurumlu et al. (2011) elaborate on how cleantech startups often can be affected by capital market frictions and are prone to economic shocks, due to highly uncertain returns. Further, the article highlights the high level of technical complexity which might make communication with investors more difficult. Consequently, this string of literature concludes that the cleantech industry is characterized by higher technology risk, higher capital intensity, as well as longer lead times when compared to other industries.

### **2.2.1 VC funds in relation to the cleantech context**

In the following sections, the literature on VC funds in a cleantech context will be described. This includes its relation to cleantech characteristics such as policies and other aspects which involve challenges and opportunities for traditional VC funds. Further, the scarce literature on VC funds' added value through human and social capital for cleantech investments will be

presented, before lastly looking into existing literatures' proposed adjustments for VC funds investing in cleantech.

### **Policies**

A large number of articles look into the impact of policies on the VC-cleantech symbiosis. Criscuolo and Menon (2015) claim that domestic policies are of great importance in energy generation, and perhaps even more for other sectors such as water treatment or soil remediation. However, the article also states that R&D support policies and market demand policies already exists, and still entrepreneurs face financial issues, but that VCs has recently played an important role when helping startups going from the lab to the market. Sun et al. (2010) argue that investing in projects with environmental benefits not only can enhance the corporate image, but can also give access to governmental policy support, implying that this support gives great opportunities. On the other side, Migendt et al. (2017) found that influence or investments by government authorities also could distort the private sector. Knight (2012) adds to this by explaining how regulations made to drive cleantech investments is a source of risk for many investors, due to its effect on the commercial viability of their investment. The literature shows that policies play a large role in shaping the cleantech industry. There is some discussion on whether the impact is mostly positive or negative, while the most common view is that policies create both opportunities and challenges. Burer and Wustenhagen (2008) also present a framework for how venture capitalists can handle the challenges that are connected to policies in the cleantech industry. They identify two ways of handling the high risks connected to government policies; active, and passive risk management. They describe active risk management as having updated boards reacting to changes and lobbying by meeting policy makers, and passive risk management as diversifying by investing in a way that include different regulations, for instance investing in countries with differing regulations. To conclude, the string describes the impact policies and regulations have on VC funds, as well as which strategies that should be used by VC funds to overcome the risk connected to the highly regulated cleantech industry.

### **Cleantech & challenges for traditional VC funds**

There exists a substantial string of literature that reviews the fit between cleantech ventures and the VC fund's investment model. Some articles also show conflicting views. Sun et al. (2010) state that the VC financing model has an advantage over many other financing models when it comes to investing in energy-efficient industries, due to how they can promote

enterprise growth by taking on incubation roles and also how their experience can better serve the company's development strategy. Ghosh and Nada (2010) add that a key difference between VC and other sources of finance, such as banks and pension funds, is that VC funds tend to invest in companies with higher technology risk, such as the clean-energy sector. However, both Ghosh and Nada (2010) and Wustenhagen and Teppo (2006) state that the clean energy sector is very capital intensive, and that VC funds typically prefer less capital-intensive investments. Gaddy et al. (2017) on the other hand, argue that cleantech do not fit either the risk, return, or time profiles of the traditional VC fund. Furthermore, Wustenhagen and Teppo (2006) point out how VCs look for investment which create private rather than social value, and how that has played a role in explaining lack of funding in the cleantech sector. This is also pointed out by Cumming et al. (2016), who explain how cleantech is to some extent a public good, seeing that no one owns the atmosphere or the oceans and therefore the benefit to society cannot be captured by the investors. They conclude that there are three fundamental barriers for VC investments in cleantech; how cleantech tend to be riskier, more capital intensive and have more social benefit than other investments.

Another challenge for VC investors in cleantech is found by Petkova et al. (2014), in how cleantech is an emerging sector and thus investors face uncertainty not only about specific startups in terms of quality and potential, but to a large degree how to think about quality and potential in the sector as a whole. This article states that a key problem is the lack of frameworks to evaluate startups in emerging sectors, such as cleantech. Wustenhagen and Teppo (2006) describe how investors usually use IPO performance of previous venture backed firms to estimate expected return, but that this method does not provide a too promising picture at first sight. Marcus et al. (2013) explain how investing in clean energy requires changes in VC funds' traditional way of investing. Further, the study claims to provide preliminary evidence that some VCs have already started adjusting their investment procedures to better fit the needs of clean energy and similar technologies. In addition, an initiative called "The Engine" has been started at MIT to offer support for tough technologies in need of patient funding, stating how tough technologies historically has been underfunded and that they want to "... transform the status quo venture ecosystem" (MIT, 2017).

Tierney (2011) explains how cleantech as a sector is challenged by how they need to make people pay more in the short term, for something they currently take for granted. Furthermore, he states that because cleantech involves a "techno-economic paradigm shift", it could take

several years before scalable and effective solutions are evident, and investments might be the only way to decide the viability of these solutions. He also argues that cleantech is specifically challenging because market acceptance is significantly slower than for safer VC sectors such as software. Hargadon (2012) also underlines this challenge, as the article claims that the current global energy system is resisting change due to how it is so fully integrated into our everyday lives and is "... literally at the core of all political economics". Thus, the literature reveals that the reason why there is a lack of VC investments in cleantech is that there is a general mismatch between the VC fund model and the characteristics of the cleantech industry, still there is evidence that some funds and initiatives are starting to adapt. The mismatch is summarized in Figure 2 below.

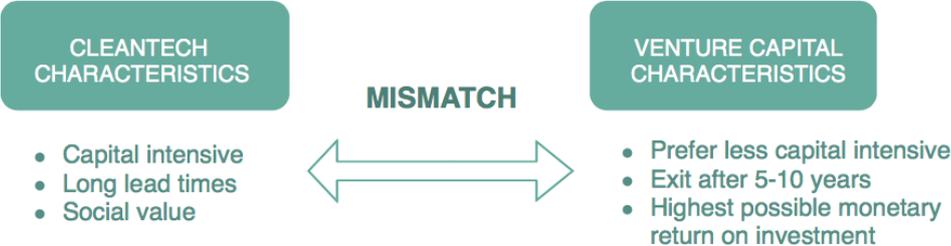


Figure 2: The mismatch between the VC fund model and cleantech

**Cleantech & value added through human capital**

There is a small stream of literature that looks into how VC funds can add value to their cleantech investments through human capital. Wustenhagen and Teppo (2006) that the need for sector specific-human capital is the reason why many funds end up specializing in certain industries, as this enable funds to lower their risk, hence gaining a competitive advantage of their portfolio. As such, they find that VCs tend to invest in areas where they have competence. Randjelovic et al. (2003) claim that generalist VC funds often decided not to invest in eco-innovation because they did not understand the specific technology and eco industry, but do not go into depth on the topic. Overall, the stream of literature highlights the importance of human capital in value added to cleantech investments, but only provides shallow research on the topic.

**Cleantech & value added through social capital**

From the literature review, only one source looked at social capital in relation to cleantech in particular, while others only mentioned it briefly. Georgeson et al. (2014) state that having a

strong network provides investors with access to expert knowledge that help them assess potential investments. The study further argues that this is particularly important within cleantech, since it covers such a wide range of technologies and business models, as well as it being a young and fast paced industry. Moreover, Georgeson et al. (2014) also makes an interesting contribution concerning VC funds' network and risk reduction. The study states that networks enable co-investing, which is desirable not only because of an increased amount of investment opportunities, but also because it greatly lowers the risk for the individual VC fund. The research also states that the necessity of networks for sharing risk, building trust, identifying drivers, investment, and interaction opportunities is well recognized in the cleantech industry. A quote from Wustenhagen and Teppo (2006)'s qualitative data sample states: "I think [...] there is one reason [for the lower level of energy VC investment] which has to do with the capabilities of people and funds.:" ... one key reason - the lack of people in funds who have a network in the energy sector." Further, Bocken (2015) also presents that lack of a proper network is also one of the reasons for lack of VC funding. According to the article, the entrepreneurs and investors often find each other through active networks, and such a formal network does not exist for eco-entrepreneurs and green investors in Europe.

### **Proposed adjustments to VC**

Another literary string talks about how VC funds can adapt to overcome the challenges faced when investing in the cleantech industry. Bocken (2015) contributes with several insights for both the investors and the startups. She states that sustainable startups need to: "... focus on triple bottom line business model innovation, find opportunity in new technology and funding platforms and develop multiple business cases to create success beyond the 'green customer base'." She adds that venture capitalists can use co-investments to reduce the financial risk and try to be more patient by creating a balance between financial and social returns. Still, she states that venture capitalists will have to tolerate slower and possibly lower returns which is reflected in social benefits instead. In addition, she states that the skills of the VCs must be developed but does not say anything about how they need to change or which skills in particular. Wustenhagen and Teppo (2006) also offer insights of what could be changed in order to increase successful VC investment in cleantech. They emphasise the importance of understanding the probability that large incumbents such as Siemens and GE will acquire VC backed cleantech startups, as this can be an important factor in attracting VC. In addition, they highlight the importance of big success stories in green VC that can attract attention and capital. This is emphasized further by Hargadon (2012) who explains how important

successful exits are, as they are followed by an avalanche of investments in companies with similar characteristics.

Wustenhagen and Teppo (2006) summarize that the most important remedy is in regard to the risk/return perceptions; the opportunities for making good returns must be demonstrated, as well as an understanding for how to manage risk will be especially important to increase energy VC investments in particular. As stated earlier, both Gaddy et al. (2017), Ghosh and Nada (2010) and Wustenhagen and Teppo (2006) agree that there is a mismatch between the VC funds' investment model and the needs of cleantech sector. Ghosh and Nada (2010) propose a solution to this mismatch, and state that if VC funds invest significantly larger sums, over a longer stretch of time, the needs of the cleantech sector would be met to a much larger extent. They acknowledge that this solution will require a radical change in the VC funds' structure and terms. To conclude, the string of literature looking into how VC funds can adapt to overcome challenges faced when investing in the cleantech sector has focused on strengthening the startup's triple bottom line, increase co-investments, as well as changing the VC investment model.

### **2.3 Combining the two fields of research**

After getting an overview of the research fields of both VC and value added, as well as VC in relation to cleantech, the two fields are combined, resulting in new and valuable understanding. By combining the two fields, the authors discovered how to fill the research gap and move the research frontier of the somewhat limited literature field covering VC funds and their investments in cleantech, as well as adding a new dimension to the already developed literature on VC funds and value added.

From the literature on VC funds and value added it is shown that human capital is considered to have a large overall impact on the performance of the fund. The literature especially highlights the importance of specific human capital as important sources of value when VC funds develop their investments. As stated by Zarutskie (2010), industry specific human capital in science and engineering is especially important for funds specializing in investments in high-tech industries. Thus, it becomes clear that human capital is very context dependent, which reveals the importance of conducting qualitative research focusing on specific countries and industries. The social capital of venture capitalists is also essential, as the lack of a proper network can be a reason for lack of VC funding (Bocken, 2015,

Wustenhagen and Teppo, 2006). However, the literature is geographically clustered around the US, with less research from other countries and also a lack of industry specific research. Thus, there is a limited amount of context specific research both in terms of looking into specific industries as well as countries. The general lack of context specific research within the VC and value added literature shows why research into the role of human and social capital for value added by VC funds in a Norwegian cleantech context could be useful.

The cleantech context is defined by a high level of technical complexity (Erzurumlu et al., 2011), making it a “high-tech” industry. Additionally, the literature describes cleantech to be highly influenced by government policies, high capital intensity, longer time leads, and “non-monetary” return. This highlights the importance of relevant social capital because the social capital of venture capitalists can positively affect the level additional funding (Alexy et al., 2012), which is needed for the capital intensive cleantech sector. Thus, bonding social capital can be of particular value for VC funds investing in cleantech. Further, as briefly mentioned by Randjelovic et al. (2003), many VC funds decided not to invest in eco-innovation because they did not understand the specific technology and eco-industry. Also, by gaining expert knowledge on the field of government policies, VCs have good pre-requisitions of successfully achieving passive risk management, by diversifying their investments in a way that include different regulations (Burer and Wustenhagen, 2008). This suggests that the cleantech industry is an industry where specific human capital is essential, and that a lack of this type of human capital is stopping some VC funds from investing successfully in cleantech today. Still, there is almost no research into this topic, as the research frontier lies on the value added, with a research gap located on human and social capital specifically. Thus, it becomes clear that investigating the VC funds’ human and social capital in the cleantech context, with particular focus on value added and characteristics such as policies, capital intensity and high market risk would be of great value to both research fields, as shown in Figure 3 below.

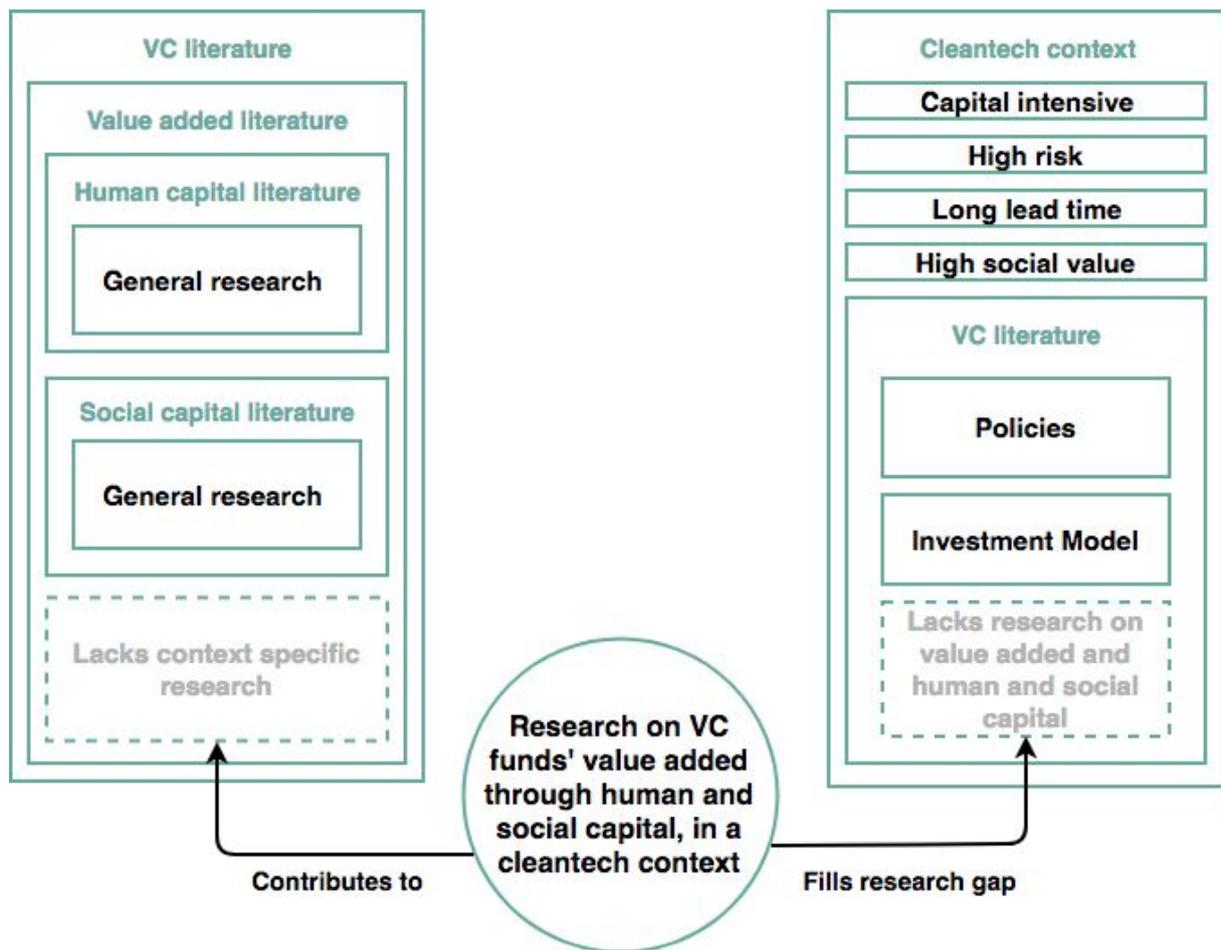


Figure 3: Combining the two research fields

As a result of the literature findings presented above, a lack of research on VC funds' value added in general and through human and social capital, particularly in a cleantech context is discovered. This led to the creation of the research questions presented in Chapter 1. By answering these research questions, the authors aim to contribute to covering the research gap presented above.

## 2.4 The framework

Based on the literature presented, the authors have developed a framework for analysing the impact of human and social capital in the process of value adding by venture capitalists to their cleantech investments. The framework concept is illustrated in Figure 4.

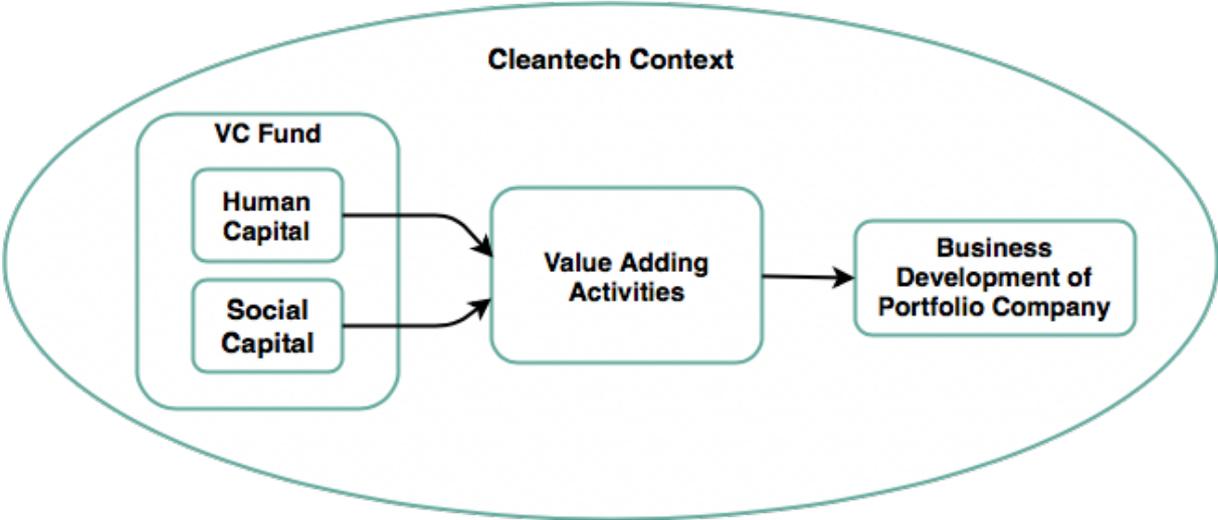


Figure 4: Illustration of the framework concept

As a basis for the analysis, a framework categorizing the value adding inputs and activities undertaken by a VC fund is used. The authors have decided to use the framework presented by Large and Muegge (2008). It builds upon 20 studies published between 1986 and 2005 and proposes a provisional eight-category framework for value-adding inputs to act as a guide for further research within the field (Large and Muegge, 2008). The eight categories are; legitimization, outreach, recruiting, mandating, strategizing, mentoring, consulting, and operating. The two categories legitimization and outreach are defined as having an external orientation, while the other six are defined as having an internal orientation. Table 2 below gives an overview of the definitions of each category, as well as sub-categories of value adding inputs. It is important to note that the sub-categories provided by Large and Muegge (2008) are presented as examples of inputs and activities, and not as a complete list, thus making the framework more flexible, and possible to modify for different contexts.

Table 2: The categorization of value adding inputs by Large and Muegge (2008)

Category	Definition	Subcategories
Legitimation	The passive process by which certain attributes accrue to the venture from its association with the VC fund.	Credibility, reputation, validation, certification
Outreach	Proactive activities that generate value for the venture by establishing direct connections to key external stakeholders and gaining their commitment.	Active promotions, introductions, negotiations
Recruiting activities	Generate value for the venture by helping to locate the most talented managerial and professional individuals and gaining their commitment to join.	Identifying, advising and/or doing recruiting, and negotiating with key employees
Mandating activities	Focusing the management team on the key performance indicators and preventing distracted undertakings.	Providing contract terms, performance targets, controls, incentives
Strategizing activities	Providing to the venture managers and directors the overarching strategic planks that provide guidance for senior and middle management decisions.	Developing business concepts and strategies, strategic planning, maintaining focus on long term strategic direction
Mentoring activities	Providing the senior managers with the more spontaneous off-the-record less structured support that is often required now by the executive managers to cope with the high-speed environment typical in a startup	Mentorship, guidance, coaching, motivation
Operating activities	Direct managerial involvement of the VC, complementing and completing the day-to-day capacity of the management team until the right management recruit is located. VCs providing operational assistance would be viewed not as outsiders, but as members of the regular management team.	Active planning, monitoring, controlling, day-to-day managing
Consulting activities	In contrast to mentoring activities, consulting activities might be viewed by the venture's managers as more formal, and they are probably provided in response to a request for assistance. In contrast to operating activities, consulting activities might be viewed as contributions from 'outsiders'.	Providing intelligence, expertise, consultation

It is worth considering that the framework and also the literature that it is built on is over ten years old, which could be a potential weakness. Therefore, it becomes appropriate to compare the framework presented by Large and Muegge (2008) with a more recent framework, to uncover any significant and recent developments in the literature on value adding inputs and activities. The framework presented by Proksch et al. (2017) is deemed suitable for comparison, as it is more recent, and also builds on many of the old frameworks among others Macmillan et al. (1989) and Large and Muegge (2008) but have additionally made their own classification of the value adding activities. When comparing the different classifications, one sees that Large and Muegge (2008)'s *outreach* encompasses both Proksch et al. (2017)'s *support through network*, and *financial improvements*, as outreach consists of; establishing direct connections to key external stakeholders, among others; co-investors. Further, both Large and Muegge (2008)'s *recruiting activities*, *consulting activities*, and *mentoring activities* go under Proksch et al. (2017)'s *support in human capital issues*, as all of these are mentioned as sub-categories of human capital issues. Also, Large and Muegge (2008)'s *mandating activities* is approximately the same as Proksch et al. (2017)'s *governance improvements*, as both are described as activities focusing the management team on key performance indicators, like contracting, performance targets, and reporting structures. Further, strategizing activities and operating activities are defined in a similar way for both frameworks. Thus, only leaving Large and Muegge (2008)'s category *legitimation* as the only obvious difference. Although it cannot be directly linked to one of Proksch et al. (2017)'s categories, it can be argued that it is partially covered by *support through network*, as the reputation of VC funds affects their ability to legitimize their investment, and this reputation form the basis for communication which networks are dependent on (Larson, 1992). Thus, it becomes clear that, although the wording and categorization is slightly different, the same activities and inputs seem to be present in both the old and the new framework. This reveals that no major changes have occurred within the literature covering frameworks for value adding in recent years. Thus, the authors have deemed the framework presented by Large and Muegge (2008) to be suitable for answering the research questions of this paper.

### 2.4.1 Further development of the framework

As stated above, the original categorization on value adding inputs by Large and Muegge (2008) lays the foundation for the theoretical framework which will be used in the analysis of this study's empirical findings. The original framework is not clear on where activities such as *hiring external consultants* and *acquiring external expertise* are placed, as they could fall under both outreach, operating and consulting. As consulting activities are seen as "contributions from 'outsiders'" (Large and Muegge, 2008), the authors have decided to define such activities under the consulting category. This is further in line with how Large and Muegge (2008) exemplifies consulting activities as "providing intelligence, expertise and consultation", thus justifying the authors' choice of categorization. Further, as mentioned earlier, the human and social capital of VC funds are essential resources in adding value to investments, and therefore the authors have deemed it necessary to include these two elements in the framework. This is also important in order for the framework to be suitable for the cleantech context, seeing as the theory suggests that VC funds invest in areas where they feel they have competence, and for the social capital part, that lack of a proper network relates to lack of funding. By adding this extra layer of complexity to the framework, it will be possible to analyse value adding activities together with aspects of human and social capital, while also keeping in mind the cleantech context, thus, providing insightful answers to the research questions.

For human capital, the categories; general human capital, task specific human capital, and industry specific human capital will be used, as they seem to be an established framework throughout the literature (Dimov and Shepherd, 2005, Zarutskie, 2010, Bottazzi et al., 2008). This is also suitable for a cleantech context by how as stated by the literature, it is a high-tech industry and as mentioned in Section 2.2.1, the need for industry specific human capital is the reason why many funds specialize themselves, enabling them to lower their risk. Additionally, the cleantech context is complex, and so in order to properly investigate the impact of human capital, all three categories are deemed necessary to be able to get the full picture.

As mentioned in the section on social capital, Putnam (2007) introduced the terms bonding social capital and bridging social capital. He is an important researcher in the field of social capital, but his work is more connected to sociology, shown for instance by how he

exemplifies these two terms. He states that for himself, his bonding social capital is the ties he has with other white, elderly professors, while his bridging social capital can be to people “of a different generation, or a different race or a different gender”. As such, this part of the framework will be modified to better suit the context of VC funds and cleantech. Thus, for this study *bonding social capital* refers to ties the VC funds have to someone who is like themselves in important ways, namely other VC funds, and similar investors. The VC fund’s *bridging social capital* will be ties to people or organisations that are unlike them in important ways, such as someone within another sector or industry. An illustration of the final framework can be seen in Figure 5 below.

Combining a framework on value adding activities and inputs with theory of human and social capital, results in a complex analysis, investigating two layers of the relationship between VC funds and cleantech startups simultaneously. In order to encompass the complexity of the topic and at the same time provide structure and consistency, a highly detailed analysis is considered appropriate. To the knowledge of the authors, there are no analysis in the existing literature on VC funds following such a complex structure. Thus, the authors believe that the framework presented in this chapter will give them a unique opportunity to provide valuable insight on the issue of value adding in a Norwegian cleantech context, and the impact of human and social capital.

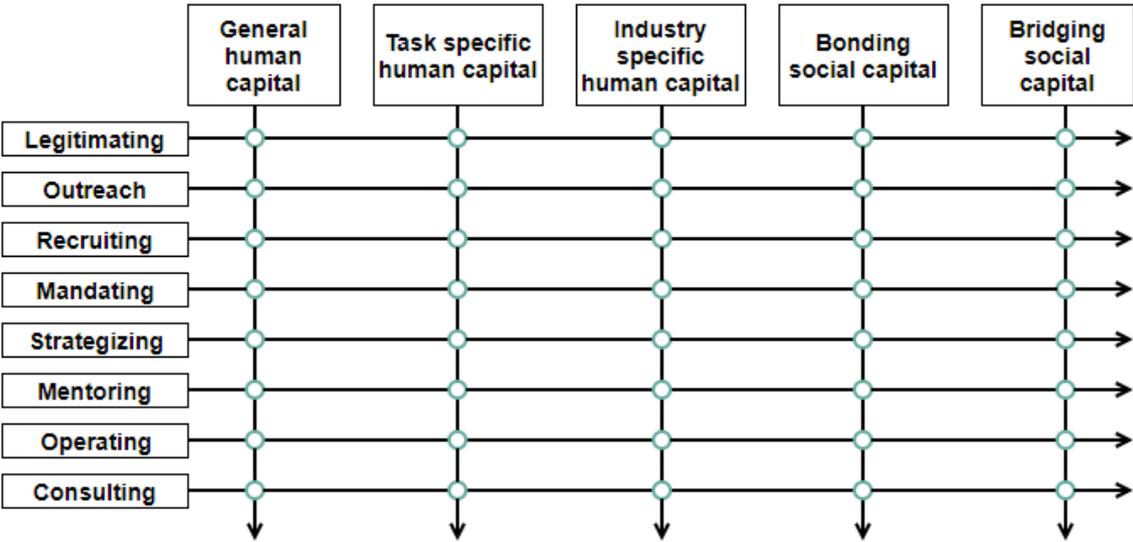


Figure 5: The final framework, with nodes representing the different points of analysis

## **3 Methodology**

This chapter will present the research method used in this master thesis. This includes a description of the research design, in which it will be explained how and why the authors used a qualitative approach. Then follows a description on how data was acquired before data analysis is elaborated. Lastly, reflections on the method will be presented including how choice of method might have affected the result.

### **3.1 Epistemology, ontology and methodology**

Within the range of different ontological, epistemological, and methodological positions ranging from naive realism to naive relativism (Lincoln and Guba, 1990, Lincoln and Guba, 2005), this study mainly adopts the position of critical realism (CR), while adding some aspects from moderate constructionism (MC). The ultimate goal of this paper is to build a general explanation as an answer to the research questions, and that this explanation can be transferred to all VC funds, thus leaning towards a CR viewpoint. Still, some aspects of the MC perspective also apply. In this paper, each VC fund and its corresponding portfolio of investments is viewed as its own separate community. The reason being that the answer to the research questions could vary between different VC funds, as it is strongly affected by the individual fund's context. Consequently, the researchers will accept that there might exist local truths within each VC fund that is not applicable to all the others.

### **3.2 Research design**

This master thesis is based on a qualitative research method, which is suitable when the research question addresses “how” and not “how many”, for understanding the world from the perspective of the studied individual, and for examining and articulating processes (Pratt, 2009). As RQ1 of this thesis aims at investigating the process of *how* Norwegian VC funds add value to their cleantech investments in general, RQ2 *how* human and social capital is utilized in this, by gaining insights from the investors' perspective, and RQ3 *how* human and social capital impact the most important value adding categories, this method was deemed most applicable. In addition, the answers to both RQ1 and RQ2 could vary greatly between different VC funds and their context, as it is dependent on a large number of different variables. A qualitative research method will therefore be appropriate to address the purpose as it allows the researchers to capture and interpret experiences that are difficult to measure or quantify (Dalland, 2012).

### **3.2.1 Case study**

This thesis focuses on how the value added, human capital and social capital of investors in the VC funds can contribute to the development of their cleantech investments. This is a fuzzy and complex connection, making it necessary to focus on understanding all the dynamics present at one single setting, which accentuate the choice of the case study research method (Eisenhardt, 1989). Hence, this paper will use the embedded, multiple-case study approach. One case is defined as the VC fund as a whole, which entails that their value added in general and through human and social capital, and its impact on several of their cleantech investments is considered to be one case study. Thus, the case study can be defined as embedded with the VC fund being the case and its cleantech investments being the unit of analysis. By adopting a critical realist belief that there is a truth that we can apprehend through observations, one should triangulate these observations through multiple-case studies (Järvensivu and Törnroos, 2010). This way it will be possible to discover patterns, as well as contrasts between different VC funds. As a consequence, the multiple-case study approach was considered appropriate.

As the position of critical realism is assumed, it was necessary to have enough cases to be able to discover patterns between different VC funds, so that a general explanation can be built to answer the research questions. Eisenhardt (1989) states that a range of four to ten cases is sufficient for generating new theory. At the same time the aspect of the moderate constructionism connected to accepting some local truths, strongly connected to their context was also assumed. Hence it was deemed necessary to go into detailed analysis of each case to fully understand its complexity.

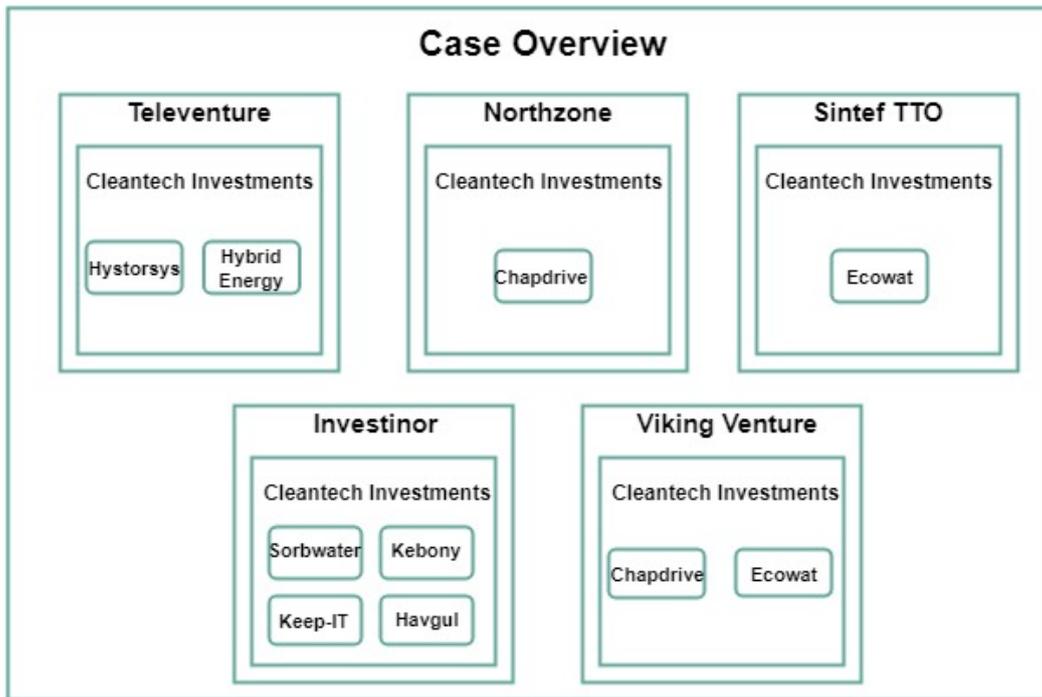


Figure 6: The VC fund case companies applied in this embedded multiple-case study

Furthermore, as the context of this study is set to Norway, there is not a vast amount of VC funds, with fewer fulfilling the criteria set below. Four Norwegian VC funds were found to fulfil the criteria: Televenture, Viking Venture, Investinor, and Northzone AS. Sintef Technology Transfer Office (TTO) was also chosen for interviews, as they manage several VC funds and could contribute in giving expert insight of the characteristics of cleantech and the commercialization of it. Seeing that there will be a detailed and in-depth analysis of each case study, five companies which each represent a case are deemed enough to discover patterns and get meaningful insights in order to accomplish the purpose of the study. As each fund represents a case, it means that all their cleantech investments can be looked into, but some of the investments will be in particular focus. Investinor was very helpful and provided the authors with a higher number of cleantech investments to look into, which is why they have more units of analysis than the other cases. All five case companies were initially identified through the Forny database, and from there it became a snowballing approach when deciding which cleantech investments to focus on. First, some cleantech investments were also identified in the database, but then additional ones were suggested by some of the funds themselves. Figure 6 above shows how the embedded multiple-case study approach will be applied in the research of this paper.

When choosing which VC funds to study, it was necessary to establish suitable boundaries and selection criteria (Stake, 1995). The VC funds used as cases was selected based on the following criteria:

- The fund has invested in at least one cleantech venture
- The fund has been in existence for five years or more, as this entails that the fund has had sufficient time to develop their cleantech investments
- The fund has had representation on at least one of the cleantech investments' Boards
- The fund is located in Norway

In order to best fulfil the study's purpose and answering the research question, the VC funds should be similar when it comes to the selection criteria, but they do not need to be of the same size. That the VC fund should be successful in their cleantech investments is not put down as a selection criterion. The reason being that it might be equally useful to examine why an investment process went bad as why it went well, which can add to answering the RQs. It is also a criterion that the interviewees must have been board members in at least one of the fund's cleantech investments, as it ensures a sufficient involvement to investigate value added. The selection process started in January with picking out and contacting the chosen VC funds. Each of the funds acted as the basis of a case study, which was conducted between February and April.

### **3.3 Data acquisition**

When acquiring data, the authors have used different methods to gather data about the same concept. Semi-structured interviews have been carried out with managers of Norwegian VC funds that fulfil the criteria set above. Additionally, complementary data about the same cases has been collected from the Forny database and publicly available sources.

#### **3.3.1 Semi-structured, focused interviews**

After the relevant case studies were selected from the mentioned criteria, the authors begun gathering data. Semi-structured interviews were chosen because it is a flexible approach which has the potential to disclose important and sometimes hidden aspects of human and organizational behaviour (Qu and Dumay, 2011). As this research aims to understand how VC funds add value to their cleantech investments in general (RQ1) and through their human and social capital (RQ2), as well as which value adding categories are the most important and

the impact of human and social capital on these (RQ3), it is a suitable approach. Further, Qu and Dumay (2011) also emphasise how this process is beneficial for understanding how managers make sense of and create meanings in their job and environment, which relates well to the scope of this research through all the research questions. All interviews made in person were held in Trondheim at the VC fund's offices, except for Televenture which was held at Scandic Nidelven. One interview was also held over the phone, as the interviewee preferred this arrangement due to a busy schedule. An overview of all the conducted interviews is shown in Table 3.

*Table 3: Overview of the interviews*

	Role in fund	Role in cleantech investment	Interview	Date	Duration
Televenture	Partner	Board member	In person	26.01.2018	60.57 min
Northzone	Partner	Chairman	Telephone	05.02.2018	39.46 min
Sintef TTO	Investment manager	Board member	In person	30.01.2018	42.30 min
Investinor	Investment manager 1	Board member	In person	22.02.2018	47.27 min
	Investment manager 2	Board member	In person	01.03.2018	35.05 min
	Investment manager 3	Board member	In person	01.03.2018	41.30 min
Viking Venture	Partner	Chairman	In person	26.02.2018	55.18 min

An interview-guide was used to ensure consistency, consequently making it easier to compare cases and gather consistent findings. This is important as there are two authors who both have conducted the interviews. In addition, the guide has helped the interviewers make sure that they have covered the intended scope of the research (Flick, 2015). The guide consisted of interview objectives divided into general, open questions of the fund and the investment, as well as more explicit cleantech related questions for specific investments, revealing

challenges and opportunities. Further, these topics dealt with the human capital of the interviewee; education, previous experience overall and more specifically in relation to cleantech, as well as social capital in form of their network. In addition, the topics aimed at getting insights of the value adding inputs and activities of the fund for the particular cleantech investment, relating to RQ1. Thus, the purpose of the interviews was to gather data mapping the value added from the VC fund, the impact it had on the development of the cleantech investment, as well as a particular focus on human and social capital. The findings were then analysed using the theoretical framework, which is presented in Chapter 5.

As the critical realist position is taken, with modern constructivist elements, the interviews have been conducted through open conversations, with both the interviewee and interviewer collaborating on discovering new insights. Thus, the authors have asked open questions, allowing for the interviewee to share their personal views, as well as more focused questions designed to encourage the interview object to share specific information that they would not have elaborated on spontaneously (Flick, 2015). The interviews have consisted of non-leading questions, but the authors probed using follow-up questions whenever the interviewee commented on a topic of particular interest. Also, follow-up questions were sent by email to some of the cases to gather additional data, and finally when all data was ready, case summaries was sent to all involved parties in order to get quote checks, avoid misunderstandings and ensure construct validity.

### **3.3.2 Complementary data**

As stated in the outset, the authors have strived to use an approach of gathering data from more than one source. According to Yin (2014), one of the biggest strengths of case studies is the possibility of using many different sources of evidence, as it will make the research's findings much more accurate and convincing. In order to gather data in other forms than interviews, the authors have accessed the Forny database to read up on background information on the cases and some of their cleantech investments. This has included annual reports and sometimes newspaper articles. Further, data and information for all five case companies have been gathered from their own websites, as well as information on the interviewees' background and experience through LinkedIn. In addition, a report from Northzone on their investment in Chapdrive was also received and read.

### 3.3.3 Literature acquisition

The research was initiated through a preliminary literature review. It enabled the authors to establish theoretical background and framework for VC funds investing in cleantech, as well as value added in general and through human and social capital in particular. The main sources for literature were Oria, Scopus, EconLit, and Web of Science. In addition to the preliminary search for literature, reference lists in read articles were used to locate secondary source articles on similar topics.

### 3.4 Data analysis

After the data was collected, the next phase of the research process was the data analysis. As the authors deemed it useful to alternate between empirical evidence from the interviews and theory found through the literature review to identify how VC funds use their human and social capital to add value to their cleantech investments, an abductive approach was chosen. The abductive research logic also fits well with both the moderate constructionism and critical realist view (Järvensivu and Törnroos, 2010). As Figure 7 shows, this approach allowed the researchers to alternate their focus between accepting existing theory and generating new theory from empirical evidence (Järvensivu and Törnroos, 2010).

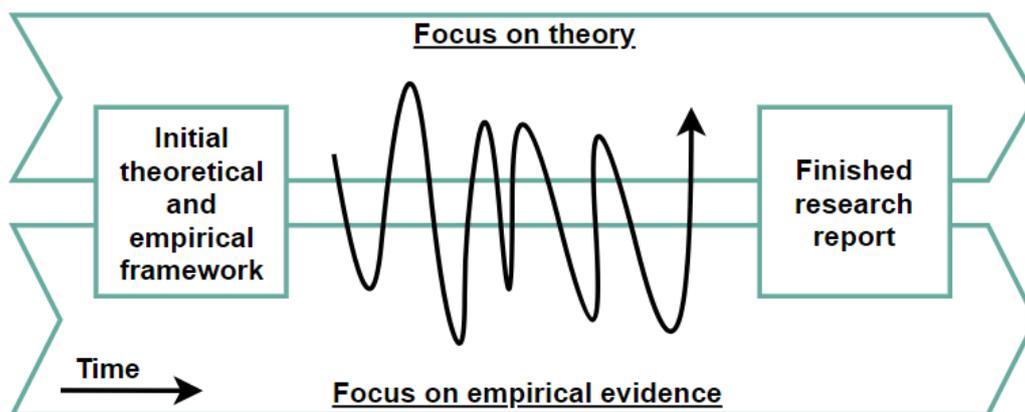


Figure 7: The abductive research process adopted from Järvensivua & Törnroos (2010)

The data analysis of each case started with the recording being replayed and transcribed word for word into a document. This was always done right after the interview or on the day after. All transcripts were saved in its respective case study folder in the database shared between the two authors. Then, the Nvivo software was used to organize the qualitative data transcripts and notes into categories comparing findings between cases, as well as creating hierarchies of

topics, providing a useful overview. Furthermore, one author did similar categorization but using text documents. Thus, the categorization has been done in two different ways, which enhance the research validity. The categorization made it easier to derive learnings and insight from the word usage and frequency patterns found in the answers (Yin, 2012). The information was then sorted into categories from the chosen theoretical framework as well as specific topics essential in cleantech, for example *regulations*. New topics were added for clusters of information that started to form (Flick, 2015), for instance *recruitment*.

To be able to answer the research question, the value adding inputs and activities conducted by the case funds were first identified, and then categorized in accordance with Large and Muegge (2008)'s framework. Additionally, the role of human and social capital in each of these inputs and activities was investigated. For findings on human capital, human capital theory was used to categorize it as general or specific, with further division between task-specific and industry-specific human capital, in order to strengthen the analysis. Social capital was divided on bridging and bonding, as described in Chapter 2. Thereafter, the impact and importance of human and social capital in each of the value adding category was analysed. As mentioned, this combined utilization of theories allows for a two layered analysis, investigating two aspects of the VC fund and cleantech relationship simultaneously. Further, the analysis was conducted in light of the cleantech context, with particular focus on how the characteristics of the cleantech industry affect each value adding category and the impact of human and social capital. This was done for each of the five cases. The results from each case study analysis were also compared to the other case studies, discovering similarities and differences, as well as to existing theory in the discussion, with the goal to build one general answer to the research questions.

The impact of human and social capital on each value adding category is complicated to measure and is therefore highly connected to the context of each case fund. Hence, to provide some tangible measure of this aspect, the grading low, medium, and high was used. This way the analysis provides visible and illustrative results, while at the same time leaving room for some margin of uncertainty connected to the aspect of context dependence. This is also in line with the methodological position taken in the paper, which states that the answer to the research questions could vary between the different VC funds because of local truths. Thus, it could be beneficial to accept slight deviations in the data for each case study, while at the same time strive to build a general explanation to the research questions. By grading the

impact of the different types of human and social capital on a scale from low to high, the framework provided a foundation for evaluating the impact of these aspects relative to each other, and also in relation to the whole range of value adding inputs and activities. The framework further acted as a basis for the discussion regarding what factors VC funds should focus on in order to improve the value added to their cleantech investments.

### **3.5 Reflections on the method, challenges and limitations**

The reasoning behind choosing a qualitative research method was described in Section 3.2, but it has also been subject to criticism and can involve some challenges. Different limitations of this thesis' research methodology are useful to be aware of. Thus, a reflection on the quality, limitations and challenges of the research design will be presented in the following two sections.

#### **3.5.1 Quality of research**

The quality of the research is closely tied to the trustworthiness of the study, consisting of its credibility, transferability, dependability and confirmability (Lincoln, 1985).

##### **Credibility**

To conduct a credible study, the authors have used more than one source of data, peer debriefing and member checks (Lincoln, 1985). Using two sources of data enhances the credibility of the study and was used by both collecting qualitative data from the interviews, as well as empirical data from the Forny database, public databases such as the Brønnøysund Register and Proff to gather information from annual reports and board composition, as well as LinkedIn profiles and the VC funds' websites. For peer debriefing, the authors had regular meetings with their research supervisor to avoid blind spots and discuss findings and conclusions, and member checks were also carried out by, as mentioned, sending the interviewees a summary of their interview. These activities also made it more likely that the claims and arguments made in the study are supported by the community. This is important seeing that elements of the MC view is used, which involves that research validity, closely related to credibility, is determined by the community and whether the claims made in the research are acceptable for the scientific community (Järvensivu and Törnroos, 2010).

### **Transferability**

The authors aimed to investigate how VC funds can be more successful when investing in cleantech startups, generating findings that can be generalized from a case-specific context. This concerns the *transferability* of the study and was attempted to be achieved by providing readers with throughout information about the demographics and background information of interview objects and the situational context of each case. According to Shenton (2004), to increase the transferability of a research study, the authors should provide enough details on the context of the cases, so that other researchers could decide whether the studied environment is similar and could be applied to a different situation. The authors have tried to ensure this by keeping an extensive online collection of tables and documents keeping all details of the research process as well as reports on each case. Still, the study can be criticized for using only five case companies, that perhaps are too similar, due to how there are not too many VC funds operating in Norway that have also invested in cleantech. As such, it could be challenging to get a true scientific basis for generalization.

### **Dependability**

Consistency in the authors' findings concerns the dependability of the study. An interview guide was used to ensure consistency in questions asked, even though the interviews were conducted in a semi-structured manner. Thus, it made the comparability of each case easier. However, each interview situation could have an impact on the result and findings from that interview. Further, as the interviews were held and transcribed in Norwegian, some words or views can have been lost in translation. Still, the research plan and implementation have often been discussed and revived together with the authors' supervisor to get feedback and thus strived to create a more dependable research.

### **Confirmability**

As this research design will build on interviews, confirmability is essential as it concerns ensuring that the study's findings are a result of the thoughts, ideas and experiences of the interview objects, rather than the researcher's preferences (Shenton, 2004). Hence, the authors needed to be aware of how their own pre-understanding and background could have an effect on their research. In addition, as a semi-structured interview approach was chosen, part of the conversation was rather open and so the authors were careful not to ask leading questions. Furthermore, the mentioned interview guide was created in cooperation with the supervisor, to also reduce the chance of leading questions based on researcher's bias.

Reflecting on the pre-understandings in advance was useful for conducting a more confirmable study. The authors have therefore included a section on the authors' pre-understanding, following next, as Shenton (2004) underlines how beliefs and reasonings for decisions made and methods chosen need to be acknowledged in a research report.

The pre-understanding of the authors could have played a role both in the preliminary literary review and the resulting master thesis. They are two students at NTNU who both are doing a five-year degree in Industrial Economics & Technology Management. Both have been part of entrepreneurial courses as well as financial courses throughout their studies. Before deciding on a specific topic of interest within venture capital and cleantech, the articles provided by their supervisor gave an introduction to the field and added to the pre-understanding. That could have contributed to making it easier for the authors to see what might be of relevance and not. On the other hand, this pre-understanding could also have led to biased decisions. The authors have tried to avoid this by discussing their choices and conclusions among themselves, as well as with their supervisor. In addition, the pre-understanding from the authors' literature review could have played a role when later conducting the interviews, which as mentioned affect the credibility of the study. From the theoretical background, the authors gained insights of how existing literature characterize cleantech and other focus areas, which made it important for the authors not to be biased when asking questions. At the same time, this theoretical pre-understanding is also likely to have been an advantage in making the interview guide more relevant and applicable for the research questions of this master thesis.

### **3.5.2 Limitations and challenges**

This study involves some challenges related to the conditions and research topic chosen. Firstly, it represents only one side of VC fund - startup relationship because only venture capitalists have been interviewed and not anyone from the cleantech investments in focus. This limits the study as it could be useful to get both sides' perspectives. Second, the interview questions mainly involve the job the venture capitalists themselves are doing, which could make it likely that they consciously or unconsciously give answers which put themselves in a positive light. Thus, the answers are to a large degree about them evaluating their own abilities and therefore reliant of the interviewees' honesty and self-knowledge. Also, the time of investment for some of the cases were many years ago, which could limit the dependability of what the interviewees remember, as well as making it prone to retrospective bias.

As also mentioned, the master thesis is constrained to a time frame starting January 2018 and ending in June 2018. This makes it more difficult to have a prolonged engagement, which according to Lincoln (1985) is important in conducting credible research. Furthermore, ethical considerations need to be made, as such issues are relevant to all research in general (Flick, 2015). The informants used in the study were asked to give consent to the interviews being recorded and were also informed about to what extent the results would be anonymized and strictly used for academic purposes. In addition, the authors reported their research to the Data Protection Official and got it approved. Overall, two main limitations are that the study only looks at value added for cleantech from the VC fund's perspective and that five case companies could be not enough to state conclusions with strong confidence or to be able to completely generalize the findings. Still, the authors have strived to get generalizable findings, and have written down which findings that are context specific.

## **4 Findings**

In this section the empirical data from all the conducted case studies will be presented. For each case, key information on the fund and its relevant cleantech investments will be given. Next, findings on the value adding inputs and activities carried out for specific cleantech investments will be described. In addition, data collected on the human and social capital of the funds will be presented. Lastly, an overview of the findings is summarized in tables for each case.

### **4.1 Case 1 - Televenture**

Televenture was established in 1993 and is considered one of the leading venture companies in Norway. The fund is privately owned and has an office in Oslo. They manage the Norsk Innovasjonskapital (Norwegian Innovation Capital, NIK) funds, with a current investment focus on manufacturing, energy, oil & gas, ITC and life science. Televenture also has a specific philosophy behind who works with which startup in their funds, which involves usually having the partners work on industry areas related to their background. Still, they believe that eighty percent of their work can be done in the same way, but in the very industry-specific cases they use specialists. An overview of Televenture's cleantech investments in focus is presented in Table 4 below.

#### **Presentation of interview object**

The interviewee from Televenture has an educational background of computer science as well as political science. He also has experience from journalism and working as a foreign correspondent, as well as having experience from starting his own companies and spending time in Silicon Valley. He has been working as a venture capitalist for almost 10 years, currently as a partner in Televenture. He usually works on investments that involve IT, life science and med-tech, but he is also a board member in the cleantech investment Hystorsys.

Table 4: Overview of cleantech investments in focus for Televenture

Cleantech investments in focus	Hystorsys	Hybrid Energy
Year founded	2005	2004
Sector	Industry	Energy
What	Provider of high purity compressors for hydrogen	Has developed a patented Hybrid Heat Pump System
Spin-off from	Norway's Institute for Energy Technology (IFE)	Norway's Institute for Energy Technology (IFE)
Active / Not active	Still active	Still active
Investment period	2012 - present	2010 - present
Outcome	Still active	Still active

#### 4.1.1 Televenture's investment in Hystorsys

The motivation for investing in Hystorsys was largely a result of the focus on hydrogen in the early 2000's, combined with new regulations connected to an opportunity to be sponsored by Akershus Fylkeskommune to build a filling station. At that time the partner believed that policies and regulations was important for making investors interested, as cleantech was only considered "nice to have". Still, as time passed, Hystorsys experienced that their market became particularly risky due to unexpected changes in these regulations. At some point it became clear that they would not get sponsored by Akershus Fylkeskommune after all, and they had to pivot the company's strategy towards the European market. The interviewee believes that a typical clean technology such as the Hystorsys solution is not very flexible when it comes to finding new markets and adapting to change, so it was very positive that they managed to locate a new, promising market. They decided to attend the Hannover fair in Germany to come in contact with potential customers, and soon realized that they had a challenge ahead:

"We suddenly had to be down in Hannover (The Hannover Fair) and show for thousands of operating hours in order to have anyone interested. Our requirements were as if we were an established industrial technology, but in reality, we were barely out of the research lab."

Additionally, certifications and requirements demanded by the industry was a challenging part of the context, and it is important to make sure that these are in place before investing in such cleantech startups. This had not been done for Hystorsys, and resulted in several delays of the company's' development, as they had to show for six thousand operating hours before any customers would buy their solution. He stated that this is important for manufacturing in general, but it is crucial for cleantech-technology in particular, as they sometimes can get pretty far in a sales process because they are “clean” and environmentally friendly, but when it comes down to actually making a sale, it cannot be done without having the right certifications and requirements in place. Furthermore, they realized that the Hystorsys technology was way too expensive for their new potential customers. They realized this because of the slow market acceptance, and that customers were not willing to pay more for their product, even though it had other features that were better than its competitors. Thus, Hystorsys had to continually focus on redesign, to fulfil the needs of the market. Eventually, they managed to reach the milestone of six thousand operating hours, which means that they now are able to offer a product that the industry wants. Hystorsys is still an active investment, and Televenture is still involved in the company. After the pivotal change that happened in Hystorsys, Televenture has changed their view on regulations being a source of opportunity in the cleantech industry: “But eventually we have seen that, if we, or when we do new investments in cleantech, it has to stand on its own feet. We cannot rely on support regimes or other things.”

### **Value added for the Hystorsys investment**

The first year they spent a lot of time documenting the market, as well as the customers' willingness to pay. Televenture believe that technology is the most important competitive advantage of the companies they invest in, but trust that the research institutes provide this world class technology. They themselves rather work on figuring out exactly how the industry wants the technology. The partner believes that is the key to success - finding out exactly how the tuning of the technology should be from the industry's perspective. This was also the initial focus for Hystorsys. Later in the process they turned their focus towards securing the right knowledge for improving their technological solution through recruitment: “...we hired a person with industry background who was very good at the mechanical, really a mechanical engineer, to see where we could cut costs.” Generally, Televenture always recruit the general manager, as well as approving those hired underneath for their investments. He thinks the general manager should be allowed to gather a team of their own, but they want to meet the

people and see whether they believe they are right for the job. Further, he explained how they in Hystorsys recruited the general manager in agreement with the entrepreneur of the company, as well as how they recruited a sales resource. The value added provided by this recruitment became visible by how this new employee were able to discover that the market they believed existed in Norway was not there after all, resulting in the mentioned critical strategy pivot towards the European market.

Other activities mentioned by the Televenture partner was coaching and mentoring: “(...) we have leaders who need coaching, and by coaching, I mean that you kind of work a little with the mental part generally, such as; you need to be more forward leaning here, and a little more confident there. The other thing is mentoring, where we kind of have to teach them something.” Moreover, they have board meetings usually six or seven times a year, and in some periods, there has also been a lot of work and projects going on for Hystorsys. This involved changing the design and doing other follow-ups, as well as attending the Hannover Fair many times, looking for potential customers and partners. Additionally, they make weekly phone calls with the general management: “... every week some hours are spent on coaching, familiarizing yourself, double checking things, and then the board meetings are mostly there to have a forum to make decisions.” On the other hand, the Televenture partner also stated that they do not use performance targets and incentives to focus the management.

### **Human capital for the Hystorsys investment**

According to the Televenture partner, policies and regulations have an impact on cleantech and therefore also on Hystorsys: “...my background is political science, so I keep up with what is going on, and of course the cleantech market has been, and still is a very political market where regulations control the demand.” Furthermore, he believes that to keep up with the political landscape he is able to use his experience from political science. Through his experience he is better equipped to evaluate risks connected to policies, and better at understanding the different consequences government statements and budgets might have for their investments.

Televenture also acquired external competence when working on investments such as Hystorsys: “When we feel that the entrepreneur is fumbling, or that we realize that he does not understand the industry, then we do it [hire consultants].” Also, he explained how it is part of being on the board, because when they sit on the board they have to evaluate what the

general manager says, and in those situations, he thinks it is very helpful to use consultants. He also added that he thinks there are a lot of good consultancy companies that are very specialized, which is what they need in such situations: "... reports from people within the industry, those who really know it." Additionally, he stated: "So accepting that you have to find someone that knows your industry better than you know it yourself, that is also important."

### **Social capital for the Hystorsys investment**

Televenture do not recruit through recruitment bureaus but by using their networks: "... just know someone who knows someone, and then systematically work and see if this is the right person." Thus, describing that their recruitment process is network based. Additionally, the partner used his network of European VC funds within renewable energy in order to investigate which part of the Hydrogen supply chain that would be attractive for Hystorsys. Still, he added that the understanding of support regimes related to renewable energy was the most important, more so than his contacts, and that he believes his background within politics and journalism has been more useful by how it makes him more able to correctly analyse support regimes and which of them Televenture can rely on, more than the contacts this background has given him.

### **4.1.2 Televenture's investment in Hybrid Energy**

It was in the early 2000's that cleantech became a term in Norway. As a consequence of this, Televenture was on the look-out for interesting ventures within this area. In addition, the Televenture partner stated that they as a VC fund have a special bond to TTOs and the fact that Hybrid Energy was a technology spin-off from IFE (Institute for Energy Technology) acted as motivation to invest in this cleantech venture.

As time passed, it became clear that a factor with a large impact on the development of Hybrid Energy was long lead times, which was mainly due to demanding engineering work. Their core technology was great, but for a period of time they were working with international tenders of 30, 40 and 50 million contracts, involving heavy, slow processes. As a result, they lost money on almost every establishment, due to delays and high construction costs. Thus, also making the development of Hybrid Energy very capital intensive. Further, certification requirements were another element. Such certification processes are very expensive, and the

Televenture partner explained that they are especially heavy for small companies such as Hybrid Energy.

Despite encountering some challenges connected to capital intensity, slow processes and certifications, Hybrid Energy is still active today, and Televenture is still involved as an active investor. Today the company has plants in both Norway and Denmark, operating within sectors such as industry process, biogas production, district heating, food/drying and dairies.

### **Value added for the Hybrid Energy investment**

The Televenture partner has not been a board member for Hybrid Energy, but he was involved with it when working at Kjeller Innovasjon. There he worked on selling the company, and he was also involved as part of Televenture. Firstly, Televenture was involved in changing the business model from selling a heat pump as an investment to customers, to offering a product that was leasing financed and that in some instances was about customers paying for saved energy use. Secondly, they offered different types of financial guaranties in order to enable the leasing model, as well as enabling supply credits and overdraft for Hystorsys. Additionally, they recruited a new general manager twice for Hybrid Energy and contributed with project management and consultants that helped the company restructure the deliverances.

### **Human capital for the Hybrid Energy investment**

For Hybrid Energy, Televenture engaged an organisational psychologist they sometimes work with. The psychologist worked with handling conflicts between entrepreneurs and employees, as well as helped with changing the understanding of different roles within the company. Human capabilities and personality was also mentioned, as Televenture explained how everyday issues like family conflicts could sometimes affect the venture more than other business-related issues. Sometimes they have to act as hobby psychologists themselves, which one person on the Televenture team is especially good at. Therefore, they deliberately put him on cases where they think that capability will be needed. Additionally, human capital in form of the Televenture partners' experience in the manufacturing industry was emphasised. For Hybrid Energy this was very much about understanding how a buyer handles a purchasing process, tenders and the importance of being able to argument using return on investment towards the CFOs of potential buyers, rather than just using the environmental aspect of a hybrid heat pump as argument.

## Social capital for the Hybrid Energy investment

As for Hystorsys, Televenture used their own contacts in the recruitment process for Hybrid Energy. They especially used their contacts within large industry incumbents such as Aker and Kværner both for recruitment and also for other aspects of developing the company. Further, they used their relationship with Innovation Norway and good contacts within that system when securing additional financing for Hybrid Energy.

### 4.1.3 Overview case 1 - Televenture

Table 5 gives an overview of the value adding activities conducted by Televenture across all the investments in focus. The activities are also categorized according to the framework of value adding inputs presented in Section 2.4.

*Table 5: Summary of case 1 - Televenture*

<b>Value adding inputs and activities</b>	<b>Theoretical categorization through framework</b>
Visit potential customers and partners	Outreach
Recruit general manager Evaluate team members	Recruiting activities
Document market and willingness to pay Investigate industry wants and needs	Strategizing activities
Mentoring Coaching Being the “positive”/”negative” investor	Mentoring activities
Hire external competence	Consulting activities
Design changes and follow-ups Weekly phone calls Double-checking things	Operating activities

Table 6 below gives an overview of the Televenture case by highlighting the most central topics covered across all the investments in focus. The topics are also categorized according to the frameworks of human and social capital described in Section 2.4.1.

Table 6: Relevant human and social capital for Televenture

	Hystorsys	Hybrid Energy	Categorizing
Relevant educational background	Political science	Political science	General human capital
Relevant industry experience	-	-	Industry specific human capital
Relevant work experience	Entrepreneur, investor, and venture capitalist	Entrepreneur, investor, and venture capitalist	Task specific human capital
Relevant networks	Research institutions	Research institutions, Innovation Norway, Industry incumbents	Bridging social capital

## 4.2 Case 2 - Northzone AS

Northzone was established in 1996, and has since then established offices in Oslo, Stockholm, London, and New York. The fund is privately owned and has a current investment focus within the following areas; artificial intelligence, communication & infrastructure, e-commerce, edtech, enterprise platforms, fintech, gaming, hardware & semiconductors, and media. Northzone has also made a few cleantech investments, among them Chapdrive, which has been described in Table 7. Northzone is an active investor through board positions, and each employee is a board member of 4-5 portfolio companies. The involvement in their portfolio companies varies, as they give the employees of their portfolio companies more freedom if they prefer it. Their focus lies on active recruitment, as well as some strategic guidance. Since the founding year, they have established 8 funds with a total capital base of 1 BN €.

### Presentation of the interview object

The venture capitalist from Northzone has a master's degree in economics both from Norway and also abroad in Europe. Further, he has experience from working in politics and also within the shipping industry. Overall, he has extensive experience from working approximately 20 years with venture capitalism. He further sat on the board of Chapdrive both as board member and chairman for some time.

Table 7: Overview of cleantech investments in focus for Northzone AS

Cleantech investment in focus	Chapdrive
Year founded	2006
Investment period	2007-2012
Sector	Wind
What	Patented hydraulic drivetrain solution for wind turbines to eliminate the mechanical gearbox and reduce cost of energy
Spin-off from	NTNU
Outcome	Liquidated 2012

**4.2.1 Northzone’s investment in Chapdrive**

Northzone’s motivation for investing in Chapdrive involved different elements. The fund had never had any interest within the petroleum field, both from an environmental mindset, but also because they didn’t have a relevant network towards Houston or Stavanger, which the partner stated was not in their interest to have either. Further, he explained that they felt their network was more relevant for understanding what was going on in the clean energy sector. In addition to this, he thinks a contributing factor were how they felt the high degree of innovation in Chapdrive would reduce the building cost of wind turbines substantially. Further, they viewed the wind market to have international potential, believing it would grow, and lastly the fact that they had co-investors with “deep-pockets and energy competence” made them invest in Chapdrive.

The cleantech context was described by how there often are political considerations to be made when investing in companies such as Chapdrive. The partner from Northzone mentioned subsidy-regimes and green certificates as examples of elements which affect this market. He further stated that the regulative character of cleantech involves more elements of risk than when investing in more private capitalistic markets, exemplified by how: “public government ruled aspects becomes an element of risk that can be sort of a ‘joker’”. He described that for Chapdrive, the technology risk in reality was much higher than for their other investments. Northzone was also involved in setting up a test installation outside Trondheim, which was very capital intensive, compared to how they as a company are more used to investing in IT, with the things they do costing less.

Eventually, the firm was liquidated, due to a period of time with dropping levels of investments in wind after the financial crisis, which made it particularly difficult to raise money for wind. This was further exemplified by how Vestas, which had planned to co-invest, suddenly fired half their R&D department. The conservatism in the energy sector was also mentioned as a challenge, and he also added that technologically the results were not as good as they had hoped, even though the technology had an advantage, it was “more incremental, rather than a quantum leap”. Thus, making the improvement too small compared to the risk of implementing a new technology.

Even though Northzone are not investing in cleantech anymore due to some bad experiences that makes it difficult to defend such investments, the partner personally believes that it is important that private capital is channelled into renewables. Still, he added that for early stage and capital-intensive processes such as Chapdrive, there is such a significant amount of technology risk that there might be need for some type of “matching capital”, favourable loan schemes or subsidies to get venture capitalists on board. He gave an example of the considerable risk by how one of their other cleantech investments within solar didn't succeed due to the Chinese coming in and fundamentally dumping the entire solar market in Europe, with price dumping, which was possible because of public subsidies and cheap loans provided by the Chinese government. The Northzone interviewee concluded this about the cleantech context: “So in sum, more capital intensive, it takes more time, you need deep pockets and patience.”

### **Value added for the Chapdrive investment**

In the beginning of the investment process, Northzone chose to focus on recruitment, finding co-investors, key personnel and customers, with emphasis on building a strong team. They were determined to find people for Chapdrive who had an understanding of the energy industry and got Hafslund and Statoil on board as co-investors. Further, the partner explained that “The thought was that Statoil could be a potential customer, and that they knew the power sector, and had deep pockets. Hafslund was a power specialist...”. He underlined how they managed to get specific expertise into the company by reaching out to people who had recently left Vestas. Being able to get the people from Vestas was also mentioned as a key reason for why Northzone dared to invest, due to how they themselves “are not wind specialists at all.” They were also central in structuring the company and defining a strategy

by how: “... there is a long way from having an exciting technology, to actually building a company with a precise business strategy, having a concise milestone plan, budgets and so on.” When it came to monitoring for Chapdrive, the partner explained how they to some degree are dependent on what the entrepreneurs or technologists say, and that these people often tend to be overly optimistic in their estimates. Hence, Northzone gather information from both the entrepreneur and external experts, as well as internal resources, to make sure that they are able to make precise evaluations.

### **Human capital for the Chapdrive investment**

Northzone chose to focus on contributing to the non-technological aspects of the startup because Chapdrive was very specialized, especially compared to Northzone’s other investments. Usually they work with companies where they as an investor have more expertise, making them able to contribute more in other areas, but for Chapdrive there were other people with the in-depth competence. As such, eventually Northzone’s contribution was more financial. Still, they spend a lot of time interviewing people with “that certain competency within the field. Because we cannot be specialists in everything...”, thus, contributing to securing competence for their investment. Additionally, the partner mentioned the fact that there is a high rate of change in the cleantech industry, so it will always be valuable to speak to people with fresh experience and competence regarding investments. Generally, he thinks it is important to have an understanding of technology in an investment such as Chapdrive. This was exemplified by how technology knowledge is perishable, such as being a programmer ten years ago is not the same as being one today, as “new things develop all the time.”

### **Social capital for the Chapdrive investment**

The partner did not feel they themselves lacked any knowledge working on Chapdrive, the reason being that even if they are not experts on everything, and especially not the wind sector, they have become very good at gathering knowledge through their network. Further, as mentioned earlier, the social capital of Northzone was an important motivation behind actually investing in Chapdrive, due to how they felt their network was particularly relevant for cleantech. When describing how they decided who to involve in the investment, the interviewee stated: “What we typically do when we are looking at some kind of narrow technology field, we use our network to find the right resources that we believe are capable of evaluating an investment.”

#### 4.2.2 Overview case 2 - Northzone

Table 8 gives an overview of the value adding activities conducted by Northzone across the investment in focus. The activities are also categorized according to the framework of value adding inputs presented in Section 2.4.

*Table 8: Summary of case 2 - Northzone*

<b>Value adding inputs and activities</b>	<b>Theoretical categorization through framework</b>
Finding co-investors Finding customers	Outreach
Recruitment and building the team Finding key personnel	Recruiting activities
Concise milestone plan	Mandating activities
Defining a strategy	Strategizing activities
Acquiring external competence	Consulting activities
Monitoring Involved in setting up test rig	Operating activities

Table 9 below gives an overview of the Northzone case by highlighting the most central topics covered across all the investments in focus. The topics are also categorized according to the frameworks of human and social capital described in Section 2.4.1.

*Table 9: Relevant human and social capital for Northzone*

	Chapdrive	Categorizing
Relevant educational background	Economics	General human capital
Relevant industry experience	-	Industry specific human capital
Relevant work experience	Founder of VC fund, city government secretary, venture capitalist	Task specific human capital
Relevant networks	Other VC funds, wind industry	Bonding social capital Bridging social capital

### 4.3 Case 3 - Sintef TTO

Sintef TTO was established in 1987 and works with the commercialization of new technologies from Sintef's research. They are owned by Sintef and has their office in Trondheim. Sintef, and thus also Sintef TTO has twelve different areas of expertise, among them climate and environment, and renewable energy, which both are of great relevance for cleantech. One particular cleantech investment is in focus for this analysis, and it is shown in Table 10. Even though they are not strictly a VC fund, they manage several VC funds such as SINTEF Venture III AS and now currently SINTEF Venture IV AS. Hence, they work with value added in a similar manner as regular VC funds and has several other resemblances to the other cases presented in this paper. Sintef TTO is involved in starting up new businesses, licensing, development, patenting, and selling new technology. It is stated that their international sales so far comprise to 450 million NOK, and the last ten years Sintef TTO has commercialized more than 80 new technologies through university spin-offs or licencing.

#### Presentation of the interview object

The interview object from Sintef TTO has a five-year degree in economics, and he also has experience from working with project management, company development, innovation, as well as some years in the banking sector. He started out as a researcher within technology strategy at Sintef and is now working on investments and business development. He was also a board member of their portfolio company Ecowat.

Table 10: Overview of cleantech investments in focus for Sintef TTO

Cleantech investment in focus	Ecowat
Year founded	2007
Investment period	2007-2011
Sector	Production, water
What	Water purification technology: drawing pure water molecules out of contaminated water
Spin-off from	Sintef
Outcome	Dissolved in 2012

### **4.3.1 Sintef TTO's investment in Ecowat**

Sintef TTO's investment in Ecowat was motivated by some regulations they thought were going to be put in place for emissions of produced water. The interviewee explained how the market they built the company for was cleaning produced water on oil rigs, but that eventually, due to changes in regulations the market would not grow big anytime soon. From there they changed their strategy and went on to a different application within frack-flowback in the US shale oil market.

After pivoting into the new market, Ecowat was able to secure some promising collaboration agreements with industrial partners. However, the company struggled to get additional investors on board. In addition, they had trouble securing commercial deals, and were uncertain about the solution's attractiveness compared to other technologies when it came to cost and performance. The cleantech context which Ecowat was situated in is by this interviewee described as having a narrower market than other sectors. This affects the commercial level of the company in form of a lower number of customers, which in turn affect the product prices. Additionally, he stated that the way customers have a lot of power can be a characterization of cleantech, and thus affect startups like Ecowat. As such, he stated how all these elements of uncertainty led them to dissolving Ecowat because they didn't want to take the chance with that high odds against them, even though he still believes it could have been a success.

#### **Value added for the Ecowat investment**

The value adding inputs and activities for Ecowat were extensive, as those on the board participated on the market, as well as on the technology side, with recruitment, on managerial issues as well as financing. In general, when Sintef TTO work on building a company around a technology, they begin by evaluating whether the technology should become a company, be sold, or licensed to an existing company. When the decision is made that it should become a company, like with Ecowat, they check the uniqueness of the technology, and the state of the market. Usually they also have to verify that the technology works, and so they did a project for verifying the Ecowat technology.

Sintef TTO was very much involved in the process of recruitment and of finding the right general manager. The first general manager was a senior researcher from Sintef who knew the technology very well, but usually they recruit someone external with experience of running a

company, or they find someone suitable who can run it together with a technology person. If so, this internal person often comes from Sintef, being familiar with both the technology and the administrative processes. Additionally, they were involved in recruiting the management team, and getting a fitting chief of technology in place. Sintef TTO was also part of replacing the general manager they first had chosen for Ecowat: “It was to let (name) do what he was best at doing, which was technology development, and then get in someone who was good at the commercial level so that the company as a whole became better commercially (...), organisationally, and to strengthen the company in total.” Sintef TTO further implemented bonus and option systems to motivate the employees, giving key employees the opportunity to invest in the company.

The investment manager also talked about the process of collaborating with investors. When they start a company like Ecowat, they want investors who can be active in the company, who have enough capital and are very much competent. This is something they strive to have in place before they actually start the company. For this specific cleantech case, the co-investor was one of the other case companies in this study. The co-investor was involved in the process as early as when Ecowat was still in the lab, qualifying the technology, and also part of a steering committee for Ecowat. Thus, Sintef TTO cooperated with them on “everything involving market, organisational evaluations...”

### **Human capital for the Ecowat investment**

For Ecowat it was important to have boards and an administration with as much relevant industry experience as possible: “... if there is an investment which has a certain distinctiveness, then we would like to have people with experience from it.” Thus, the investment manager believes industry experience is important. Further, he explained how he used his own experience within commercialization of technology in a lot of his work with Ecowat. For instance, they have created a three-phase model on business concept, business plan and commercialization, which he used on this investment. Additionally, he used his experience from being an investor in other technology companies, and also previous work experience in project management for setting up and managing project implementation. Lastly, his time within the banking sector made him able to make economic analyses which were useful for the development of Ecowat, and together with his general human capital from an economics education it results in a combined competence on marketing, sales, organisational and international relations.

### **Social capital for the Ecowat investment**

For business development in Ecowat, the investment manager used his network within the finance sector in particular, without going further into details on what value it gave or how it was used. Further, he stated that he did feel like his experience from working in banking has given him a better network, but that it was not specifically utilized to a large degree in Ecowat. It is therefore assumed that the banking network and finance network are two different set of contacts.

### **4.3.2 Overview case 3 - Sintef TTO**

Table 11 gives an overview of the value adding activities conducted by Sintef TTO across the investment in focus. The activities are also categorised according to the framework of value adding inputs presented in Section 2.4.

*Table 11: Summary of case 3 - Sintef TTO*

<b>Value adding inputs and activities</b>	<b>Theoretical categorization through framework</b>
Financing Find competent co-investors	Outreach
Replacing CEO Recruiting the management team	Recruiting activities
Bonus and option systems for key employees	Mandating activities
Check the market	Strategizing activities
Managerial support Check uniqueness and verify technology	Operating activities

Table 12 below gives an overview of the Sintef TTO case by highlighting the most central topics covered across all the investments in focus. The topics are also categorized according to the frameworks of human and social capital described in Section 2.4.1.

Table 12: Relevant human and social capital for Sintef TTO

	Ecowat	Categorizing
Relevant educational background	Economics, international business	General human capital
Relevant industry experience	-	Industry specific human capital
Relevant work experience	Project management, company development	Task specific human capital
Relevant networks	VC funds	Bonding social capital

#### 4.4 Case 4 - Investinor

Investinor was established in 2008, and is currently investing in mainly energy, IT, marine, environmental technology, health and forest industry, with NOK 500 million earmarked to aquaculture and the forest industry. They are owned by the Norwegian Government and have their office in Trondheim. Investinor manages NOK 4.2 billion and is responsible for more than one third of all venture capital invested in Norway since 2010. The fund acts according to a policy of responsible investments based on the UN's Global Compact initiative and UN's Principles for Responsible Investment. An overview of their cleantech investments in focus is given in Table 13 below.

##### Presentation of the interview objects

Three investment managers have been interviewed from Investinor; one involved in Sorbwater, one involved in Kebony, and one involved in Havgul and Keep-it. The person who sat on the board of Sorbwater has an engineering education as a ship engineer, and also a lot of experience from working with oil and gas, both onshore and offshore. Additionally, he has experience from running a consultancy company, focusing a lot on its internationalization process. The second interviewee was responsible investment manager for Kebony. He started his career as a lumberjack, but eventually wanted to become an academic. His education is a doctorate on forestry economics, with an MBA as well. Thus, his background involves extensive experience within forestry. For almost 20 years he worked in a bank, mostly working with forest industry within the banking sector, being their "global industry expert on

forestry”. Lastly, the person who was main responsible for Havgul and Keep-it has an education within economics, biology and also aquaculture. This person also has experience from working as a consultant within strategy and business development, with a specific focus on fisheries and aquaculture, as well as experience from being a CFO for a large salmon company, taking part in developing the company. Overall, all of the three interviewees have some experience within economics or finance, combined with extensive industry experience within their own respective industries.

Table 13: Overview of cleantech investments in focus for Investinor

Cleantech investment in focus	Sorbwater Technology	Havgul	Keep-it	Kebony
Year founded	2007	2007	2001	1997
Investment period	2017 - present	2010 - 2018	2010 - present	2014 - present
Sector	Oil & gas, water	Wind	Aquaculture and others	Wood and forestry
What	Cleans produced water, slop water and wastewater	Develops wind projects ready to be built	Patented indicator monitoring temperature to show actual shelf life of product	Environmentally friendly cladding and decking process using sustainable softwood
Spin-off from	n/a	n/a	Norwegian University of Life Sciences	University of Brunswick, Norwegian University of Life Sciences
Outcome	Still active	Ongoing exit through sale	Still active	Still active

**4.4.1 Investinor’s investment in Sorbwater Technology**

The motivation behind investing in Sorbwater was strictly based on financial reasons. The company was presented to Investinor by other investors that they knew and had cooperated with before, who wanted new capital and fresh workforce to develop it further. They always cooperate with other investors, as: “... we do not have the opportunity to do anything else. We are absolutely dependant on cooperation. We are never majority owner.” During the due

diligence process leading up to the investment, they discovered that the chemical part of the company had untapped potential. This realization acted as another motivational factor for investing. After the investment was made, Sorbwater pivoted into focusing only on the chemicals part of the business, as suggested by Investinor.

Regulations were an important aspect of the Sorbwater context, as the chemicals from Sorbwater are categorized as green and degradable, while the chemicals they are to replace in the North Sea and the UK are non-degradable and regulated as red or black on oil rigs. This means they are actually illegal to use if there exist alternative solutions that are just as good. Even though regulations are an important aspect of cleantech, the Sorbwater interviewee underlined how it cannot be the main reason to invest. The reason still needs to be based on something the customer needs and wants. He underlined this by stating that: “We do not use regulations as argumentation for growing a market. It is deadly.” Sorbwater is still active, now offering three different products, and Investinor is still an active investor. Currently the company is in partnership with Statoil, FMC Corporation USA, FMC Technologies, Step Oiltools and also Blue Ocean Technologies within aquaculture.

### **Value added for the Sorbwater Technology investment**

In a company like Sorbwater, Investinor work a lot on the strategy side of things, and especially with market strategy. Thus, for Sorbwater they have a main focus on market development. For this they also contributed by buying a market report from Arkwright which the company team still uses daily. It gives insights to sales arguments and gives a more detailed market understanding than they had before. Further, as mentioned Investinor played an important role in how Sorbwater pivoted into the chemicals business. They did evaluations and inspections which led to Sorbwater no longer selling hardware and complete solutions, “... because they are time consuming.” This was not a result of them having any kind of eureka knowledge on what the company should do, because: “The knowledge is always in the companies, but we ask questions and drill into it...” Thus, asking questions and challenging the founders and people in their investments, as well as hiring external competence are value adding activities Investinor perform in cleantech.

Two contributions were highlighted as essential by the investment manager, namely organizing the team and making plans that correspond with sales and market plans. This process usually starts with a due diligence of the team, which they sometimes do themselves

or they use someone external like consultants. In doing so they “... map competence and interaction in the management group or team. To then see that we have the total competence and that they interact well enough together to deliver on the plan.” Additionally, Investinor use incentive systems such as bonuses tied to milestones and the investment manager stated that it was important that goals and milestones correspond with the final objective for the investors, namely selling the company. According to the investment manager, general aspects, such as organisational strategy, financing and market solutions are universal and not cleantech specific. Further, Investinor “are not set against doing lobbying towards government” and “not more capable than others to better see which new policies and regulations that will come.” Thus, he believes they need to work the exact same way for cleantech because they mostly care about market size and the advantage of the market.

### **Human capital for the Sorbwater Technology investment**

Today, two people from Investinor are involved in Sorbwater; the interviewee who has an industrial background, and another senior analyst within oil and gas who is more of a “number cruncher”. When Investinor enters a company, and through the investment phase, the aim is to get to know both the company and their co-investors. If it then becomes clear that the responsible people from Investinor do not possess the right knowledge to develop the company and challenge the management, they might do a shift, but usually a bit later in the process. He explained that for Sorbwater, they have not yet reached the stage of shifting out the people responsible for this investment, as the investment is so new. Further, the interviewee has a lot of international experience, also from the Middle East which was the market Sorbwater initially aimed for. He was able to use his experience from the region by being aware of the fact that “...if you want to get through the door of PDO [Petroleum Development Oman] in Oman or Kuwait you have to be with a big company, and for us that was very clear”.

Investinor has their own industrial advisors, also one for renewable energy and environmental technology. He was not used in Sorbwater, but they might use him to review markets and new technologies and evaluate or write reports in the future. As such, they are in-house consultants, and the difference between them and when Investinor acquire other external competence, like with Arkwright in this Sorbwater investment, is “... the ones we have now we have built relations to and we can be even more open with them. We can let them more in on our investment hypotheses (...). Often they are the link between market research and our

case.” Lastly, the interviewee highlighted what knowledge he felt like he lacked when working with Sorbwater, namely; how to overcome the high degree of conservatism connected to using new technology in the industry, both by companies and down to the individual level. He believes that the conservative attitude stems from the fact that: “well I think it is as simple as you never get caught for doing the same as last time” but could not figure out how to overcome this issue for Sorbwater.

### **Social capital for the Sorbwater Technology investment**

Initially, the investment manager used his network to get a technical and professional evaluation of Sorbwater’s technology and potential. He reached out to his former colleagues at Statoil for getting this support. Further, he explained that in this investment he also utilized his network at higher management levels, when trying to understand the challenges and resistance against Sorbwater selling in their technology in conjunction with planned pilots. So far without success. Additionally, he provided Arkwright with several of his contact before they conducted the mentioned market analysis which is the foundation for Sorbwater’s sales and market strategy. Further, he believes that even if Investinor does not have a strong enough team specializing in cleantech today, they are able to invest successfully because of their extensive network. He believes that by focusing on actively including their collaborators and industrial advisors in their investments, Investinor is able to compensate for a lack of specialization on the field.

The image and reputation of Investinor also proved to be helpful in adding value to Sorbwater. They got quite a lot of newspaper articles and positive press coverage, which caused a lot of phone calls, even from industries Investinor and the others had not known of or found in their initial market review. Eventually, it became evident that the Sorbwater technology also can be used in fish farming, which is now a new business unit in growth within Sorbwater. The investment manager explained that Investinor believe in the importance of creating a very good plan, but that it is also crucial to be able to deviate from it when opportunities arise.

#### **4.4.2 Investinor’s investment in Kebony**

Kebony was viewed as an attractive investment because of certain elements, like how their solution was patented, and the uniqueness of the product. Additionally, it had a global potential and had built a strong brand, earning the nickname “Gucci of forestry”. Having a

more expensive product, with excellent quality and a solid brand is something rather new within forestry according to the interviewee. Further, regulations have also been a driver of growth. The reason being that the Kebony solution replaces tropical wood, and new regulations force the sale of these types of wood down, due to strict rules of certification. In Norway, Kebony market themselves as being a better and more environmental replacement for copper impregnated wood, which is categorized as hazardous waste. As there is quite a lot of focus on the deforestation of tropical forests, regulations are something that acts as a main sales argument abroad.

Currently Kebony is losing money, but he stated that it is due to them building a market and growing the company. The same year Investinor went into Kebony [2014], they launched in the US, in 2016 they expanded the factory in Skien and in 2017 the work on a new factory in Belgium began. The company has also won several awards within cleantech, innovation and design.

### **Value added for the Kebony investment**

Investinor usually say they contribute with three main elements: capital, competence by being a “sparring partner to the management and active contributor to the board”, and third a network of contacts. For Kebony specifically, they have been part of creating an expansion strategy, been involved in hiring processes, finding and recruiting good people, as well as financial contribution in the form of equity and financing from banks. Further, they cooperated with the other investors in Kebony to get bonus- and share option systems in place. This was done to make sure that the company achieved important milestones in relation to value creation. Additionally, Investinor evaluated risks for Kebony in relation to the regulative market they operate in: “...we don’t work with lobbyist or things like that. But we try to pay attention to what is happening. When we make an investment, we use a lot of time analysing all these elements of risk...”

### **Human capital for the Kebony investment**

The majority of chairholders on the Kebony board have financial backgrounds, while the investment manager from Investinor contributes more with sector specific competence. This was according to him also the reason why he was brought to Investinor, seeing as they have a substantial amount of money earmarked for investments in the forestry industry, they needed someone with expertise on the area. Overall, he believes his industry expertise means he can

contribute with something else than the others at Investinor: “The moment you know industries and dynamics and actors and such, you can contribute more. Not all the time, but, it is... I have always believed it is a great advantage to know an industry. But, on that point the scholars disagree. Most investors are generalists though.”

According to him, it is very common for VC funds to buy advice from external sources, instead of having the same knowledge in house. He believes that the difference between utilizing inhouse versus external sources of knowledge is that you have an advantage when attending board meetings and do daily work when you have a lot of knowledge easily accessible in your own head. He can do this in Kebony thanks to his experience in the forest industry, while others have to call their advisors. Summing up he stated that: “But the point is that industry knowledge is important either you sit on it yourself, or if you buy it, and both works. But I essentially believe it is better to have the knowledge yourself.”

### **Social capital for the Kebony investment**

As mentioned in the section on value added, one of three main elements Investinor often contribute with to add value to their investments is their network of contacts. The investment manager explained how: “We have a rather valuable database with board members, new CFOs or CEOs and as such.” This shows how they use their connections and network in for instance recruitment. Furthermore, he stated that his own industrial network was utilized several times for Kebony, like when they needed more suppliers of timber in the Nordics and he connected them to some Swedish candidates. Another example was that Kebony wanted to do an analysis based on forest resources, investigating where in the world there are commercial pinus species which could be potential locations for a new Kebony factory. He did the first analysis, and then connected them to the Finnish consultancy company Pöyry. Additionally, he had quite a lot of contact with other VC funds because they have had several placement rounds in the period Investinor has been an owner.

Investinor as a governmental institution investing in Kebony was beneficial for the company by how it gave them more credibility which then led to additional financing. This credibility was important in order to get financing from banks, and also created some interest from other investors. In order to increase the passive value of credibility, Investinor often do speeches at forestry conferences and incorporate a plachet on the greatness of Kebony.

#### **4.4.3 Investinor's investment in Havgul**

The motivation for investing in Havgul was yet again mainly the potential for monetary reward. Still, it was stated that Havgul is a pure environmental investment, seeing as it is a wind project, and that Investinor have a strong focus on prioritizing such investments. Additionally, they saw that Havgul had a range of required characteristics; international potential, potential to give a big enough return, a unique product or business model, scalability and a talented team.

Looking back the interviewee explained how he thinks they should have looked more into the resolution regimes for wind projects in and around Norway, as well as inspecting the processes and the involved challenges. Many of the processes undertaken by Havgul were described as complicated and time extensive, resulting in slower development of the firm than anticipated. Additionally, he stated that they met several conflicts of interest on many different levels: municipality, landowner and national level, which heavily impacted the development of Havgul. Still, it seems like they managed to overcome most of these challenges as Havgul Clean Energy AS now in delivering wind projects in Norway, Sweden and the US, with Investinor almost exited from Havgul by now and currently expecting a positive return.

#### **Value Added for the investment in Havgul**

For Havgul the team and the business model were already pretty clear when Investinor got involved in the company, and therefore they were less active in this cleantech investment compared to some of their other investments within cleantech. However, one aspect that proved to be both important and quite challenging was carrying out a thorough enough market analysis to be able to see through hypes and trends. This is not only a focus area for Havgul, but for any future cleantech investments they will make in the future.

The value adding activities that Investinor has undergone for Havgul were described as first and foremost contribution by using their network and relations to put in place the board composition. Additionally, they put bonus systems in place for the employees. He further explained how due to Investinor being owned by the state, they could have a shorter way to decision-making bodies, adding "...or at least we are able to contact them, tell them who we are, and most likely arrange a meeting, or arrange for the investments to meet these decision makers...." However, he does not think that they have any direct advantage over other VC

funds in cleantech because: “We have the ability to meet and to be able to influence, but I would say others also have that same opportunity.”

It was also explained how Investinor is perceived as a trustworthy and solid investor, and that due to this reputation their investments such as Havgul can experience a positive development in two areas: recruitment and attracting co-investors. However, he added that the underlying development in the companies is more important and that Investinor getting involved is rarely an isolated factor giving a positive contribution. In order to enhance this passive contribution, Investinor does networking through meeting other investors both nationally and internationally, meeting industrial actors, academic communities and politicians. Additionally, media and conferences are used to promote both portfolio companies and Investinor themselves.

### **Human capital for the Havgul investment**

When investing in Havgul, Investinor had a particular need for understanding the Norwegian, Swedish and American wind engineering market. To get this they acquired external expertise within the wind industry, in order to supplement Investinor with market information and market understanding.

### **Social capital for the Havgul investment**

Investinor contributed to the business development for Havgul through utilizing their network in appointing an external chairman. Additionally, they used their network to be able to meet politicians and present Havgul and its business model. In the exit process of Havgul, they have contributed using their network to facilitate and find potential industrial buyers. Further, the investment manager’s best advice for future cleantech investments would be to be better at finding communities with the right competence and experience, whenever they themselves lack it. Seeing how they do not really have industry expertise within wind themselves, it could imply this is an experience they have from investing in Havgul, highlighting the importance of a network to find the right competence. Also, their network was mentioned as an important aspect of why Investinor is very much motivated to do similar types of projects in the future. He explained how they have made even more connections and gotten a bigger and better network through their experiences investing in the industry, than what they initially had.

#### **4.4.4 Investor's investment in Keep-it**

When Keep-it came to Investinor looking for funding they had already developed a solution with indicators for perishables. The interviewee, and also other employees at Investinor saw that the indicator had great potential also within the marine sector, among others, which acted as a large motivation for the investment. He stated that: "... seeing how I know that industry well, I know that fish is a complicated perishable. And that was one of the things which triggered us to think that Keep-it could be interesting".

Investinor and the other owners of Keep-it experienced that there is a current trend and focus on sustainable and environmental solutions by how they got a lot of backing in the market both from the government, media, and NGOs, when it comes to avoid throwing away food. Especially the last couple of years there has been an emphasis of the challenges with food waste, which has been beneficial for Keep-it. Still, he added that even though there is a lot of hype, it is not that easy to materialize it into business. Nevertheless, Keep-it had by the end of 2017 managed to sell more than 40 million indicators, and Investinor is still an active investor in the company.

#### **Value added for the Keep-it investment**

Keep-it is still in the managing phase with the interviewee having main responsibility for that company today. For Keep-it, Investinor worked closely with the rest of the board, the owners, and management on elements such as the strategy, developing the business model, and contributing with market understanding through their analyses. Also, he explained that because Keep-it was more of an early phase company, they have been more involved in the development of the business plan, setting the course, compared to how they were involved in Havgul. For Keep-it the technology was in place, and the main aspects of the strategy. Still Investinor has taken part in strategizing by including seafood as one of the focus areas of the startup, pushing for a more systematic strategy within this segment, as well as some other modifications to the initial strategy plan.

#### **Human Capital for Keep-it**

As described earlier, this interviewee has human capital tied to both education and experience with finance and aquaculture. When an opportunity at Investinor came about, he thought that the sum of the experience and competence he had was very much suitable, and now he has the main responsibility for the marine sector at Investinor. Since the venture capitalist knew the

industry well, he was able to share insightful information on the topic, which as mentioned then triggered Keep-it to move into that market. In addition to the interviewee's experiences in the seafood industry, Investinor has an additional couple of employees who have had leading positions within this sector. He believes that this give Investinor a clear advantage when investing in companies like Keep-it. For example, due to the fact that Keep-it decided to move in on the seafood market, it has contributed to getting a customer base founded in the local market, which they then have built on with other products.

The mentioned in-house consultant with cleantech competency was involved in the Keep-IT process. Similarly, to the Havgul investment, the consultant was not involved in the early stage of the investment process, as he was not yet been employed at that point in time. However, since being hired he has acted as a discussion partner and consultant in areas where his expertise has been relevant. The interviewee believes that having in-house competency is better than hiring external expertise because it boosts the teamwork, discussions, and meetings happening on a daily basis. Thus, his view is that in-house competency has a dimension that is difficult to obtain with someone external, even if you have good ties with them.

### **Social capital for Keep-it**

The interviewee believes that the competence that Investinor has within the seafood and consumer industry not only contributes to value added in the form of knowledge, but also through network. He believes that by having experience from an industry, you are able to create a network of relevant industry players that can be very convenient. This network can be useful when it comes to having partners for discussion, but also sources of up to date knowledge from the industry, as well as to put Keep-it in touch with potential customers and suppliers. Investinor has also used their network with other investment companies to attain co-investors as well as keeping potential future co-investors informed about the company's progress. He believes that it gives an advantage to have strong relations to both independent advisors as well as industry experts, and that having these types of networks acts as a motivation to invest in similar projects again in the future.

#### 4.4.5 Overview case 4 - Investinor

Table 14 gives an overview of the value adding inputs and activities conducted by Investinor across all the investments in focus. The value added is also categorized according to the framework of value adding inputs presented in Section 2.4.

Table 14: Summary of case 4 - Investinor

<b>Value adding inputs and activities</b>	<b>Theoretical categorization through framework</b>
Utilize image and reputation for publicity, additional financing and recruitment	Legitimation
Additional financing from equity Additional financing from banks	Outreach
Forming the team Recruit board members	Recruitment activities
Being an active contributor to the board Bonus and share option systems	Mandating activities
Market development Market evaluation Developing the business model Building strategy	Strategizing activities
Being a sparring partner to the management	Mentoring activities
Buying report from external consultancy company Acquiring external expertise	Consulting activities
Plan for their entire investment Sales plan Market plan Day-to-day teamwork discussions	Operating activities

Table 15 below gives an overview of the Investinor case by highlighting the most central topics covered across all the investments in focus. The topics are also categorized according to the framework of human and social capital described in Section 2.4.1.

Table 15: Relevant human and social capital for Investinor

	Sorbwater	Kebony	Havgul	Keep-it	Categorizing
Relevant educational background	Engineering	Forestry, economics	Economics	Economics, biology, aquaculture	General human capital
Relevant industry experience	Oil & gas	Forestry	-	Aquaculture, consumer	Industry specific human capital
Relevant work experience	Managing consultancy company, venture capital	Forestry within banking, venture capital	Consultancy, venture capital	Consultancy, CFO salmon company, venture capital	Task specific human capital
Relevant networks	Oil & gas, VC funds	Forestry	Politics, VC funds	Aquaculture, consumer, VC funds	Bridging social capital, bonding social capital

## **4.5 Case 5 - Viking Venture**

Viking Venture was established in 2001 and is currently a niche fund investing in subscription based B2B (business to business) software companies but used to be generalists at the time of their cleantech investments. They are privately owned and have offices in Trondheim and London. Since their establishment they have had 23 successful exits and 5.000 million NOK in sold companies. In 2014 they transitioned into a deal-by-deal structure, thus deviating from the traditional VC fund model. An overview of their cleantech investments in focus is given in Table 16.

The members of the Viking Venture team have a variety of different backgrounds, ranging from civil engineering, computer science, acoustics, electronics, to economics. However, they do not explicitly use each and every one's competence and knowledge by which background they have. Instead, they use the entire team and facilitate it through Monday meetings where all decisions and issues are discussed among everyone at Viking.

### **Introduction of the interview object**

The interview object from Viking Venture was board director of Ecowat. Due to Viking Venture's team based working style he was also heavily involved in Chapdrive, even though he did not hold a place on the board. His background is a master's in finance and strategy, experience from banking and consulting and working with corporate finance. Further, he has been working as a venture capitalist for almost 15 years, currently as a partner in Viking Venture.

Table 16: Overview of cleantech investments in focus for Viking Venture

Cleantech investments in focus	Chapdrive	Ecowat
Year founded	2006	2007
Sector	Wind	Clean water
What	Develop, commercialize and sell specific components for wind turbines	Cleaning wastewater from industrial purposes into perfectly clean water
Spin-off from	NTNU	Sintef
Active / Not active	Not active	Not active
Investment period	2010-2012	2007-2012
Outcome	Liquidated in 2012	Dissolved in 2012

#### 4.5.1 Viking Venture's investment in Ecowat

The motivation for making the investment in Ecowat had several aspects. First, Viking Venture had good experience with technologies from Sintef, as well as a focus on a close collaboration with Sintef when advertising towards their investors. Additionally, The Norwegian Research Council had verified and supported the technology and Ecowat had reached all milestones. The investment was also within an area which they believed in, as it was: “about using cleantech within an industry with a specific need”. Thus, the vision for Ecowat was to reduce emissions from gas turbines on the Norwegian continental shelf by between 70-90%, with all other alternative solutions to reduce these emissions being extremely expensive. Further, he described how they saw a big market for their technology, and they saw a willingness to pay for it among potential customers.

At the time Viking Venture entered Ecowat, there was a public, ongoing discussion of electrifying the Norwegian continental shelf. Further, the Gothenburg protocol had made new regulations on emissions that the industry had to adapt to within 2010. Thus, Ecowat was situated in a cleantech market which was described as promising, but also quite challenging, partly due to the fact that they were both trying to replace an existing solution, and the high market risk connected to their dependency on regulations. The partner further described that it

is the combination of this market risk with an equally high technology risk which ultimately makes cleantech investments more difficult than other investments. Regarding the market risk, he highlighted the importance of assessing the nature of the regulations in place, and making sure that they are actually implemented, and not just a distant promise.

After a while, it became evident that the market they planned on entering, was not in reality there. He elaborated by explaining that big companies with a lot of influence often manages to move or change upcoming regulations to better suit their own needs, making them difficult to rely on for other companies in the market. On the basis of this, the importance for cleantech startups to have a value proposition that is still valid even if there is a change in the regulatory environment was highlighted. This was something they thought Ecowat had, as in addition to having huge potential in the oil industry it was stated that Ecowat had potential in both the cosmetic and pharmaceutical industry: "... so even without legal requirements there would be possibilities." Still, the company experienced problems due to the fact that they were trying to do something which had never been done before. They managed to get water a lot cleaner than anyone else, but Statoil who were a potential customer in the beginning and an important part of the project, eventually chose a simpler technology. According to Viking Venture, this ultimately resulted in the decision to dissolve the company in 2012.

### **Value added for the Ecowat investment**

As with their other investments, Viking Venture worked actively with Ecowat, pretty much on a daily basis, trying to commercialize it, trying to get it from a development project to building a company. To establish a business foundation, Viking Venture also participated in carrying out a market analysis. Emphasis was put on the importance of the market analysis to determine whether there is a market or not, and if it is, is anyone willing to buy the product if they manage to get it ready. Additionally, they were heavily involved in recruiting people to the company and building a good initial team. They used a recruitment bureau called Horton, giving them a specification for the person they wanted, leaving it to the recruitment company to find suitable candidates. However, he stated that: "There are very few within the oil industry, especially at this time [when the investment in Ecowat was made], they are in secure jobs, make shitloads of money, to leave a secure job to join a startup that has no proven technology... Extremely difficult." Thus, explaining that recruiting the right people was one of the challenges in the Ecowat investment. After recruiting people, they were incentivized

through ownership of Ecowat, and Viking Venture also put in place bonus systems for various areas such as technical milestones or EHS (environment, health and safety).

A lot of the activities which were conducted in the initial screening process, before the investment in Ecowat was made, also contributed to adding value to the startup. For instance, relevant regulations such as the Gothenburg Protocol, made Viking Venture talk to both the Norwegian Environment Agency and the Research Council of Norway. The partner explained: "... and we also had several rounds with them where we talked to them in order to understand; is this a regulation just on paper or is it something which will be implemented." He also described how they normally interview around 20-30 people before making an investment, which includes customers, users and suppliers. Viking Venture use about six months from starting to look into the company, to making an investment. These activities gave insight that was later proved useful in strategy development.

The interviewee is not under the impression that they lacked any knowledge or competence when investing in Ecowat, it was more about competence lacking in the Ecowat team which relates to recruitment. Much of the initial recruitment was done by getting people from Sintef with relevant competence, the first two recruitments being civil engineers with experience from water treatment. However, they were not able to acquire the specific niche competence needed from the oil industry. This he said was an important lesson: "how you might think you have someone with experience with water which can be transferred to your case, but then in reality it is more difficult." Overall, the partner believes there are few differences between developing a cleantech startup and a regular startup, as it all boils down to being "good business" or not. Viking Venture rather focuses on whether the company is early or later stage, stating that for early stage the most important thing is to determine if there is actually a growing market, as well as the size of this market. Moreover, he added that for Ecowat this gave them an important lesson: "... to build a market, that is very high risk."

### **Human capital for the Ecowat investment**

One challenging aspect of the investment in Ecowat was that a lot of the communication was with people described by the partner as the "evangelists" of the industry. In other words, the people who were really burning for the technology and the concept to work, strongly believing in the importance of green and sustainable solutions. Less communication was done with the people who were going to pay for the system and use it every day. He exemplified by

stating that in their collaboration project with Statoil they had a lot to do with their water research department at Rotvoll, but not much collaboration with the people responsible for “producing specific amounts each year, to the lowest possible price”. So, when Ecowat was ready to commercialize their product, it turned out that the sales assets responsible for making the decision to sign a deal with Ecowat or not, decided that this was not the type of technology they wanted after all. This experience made Viking Venture more aware of which type of people they should have spoken to, and it could show that they at the time lacked such insight.

### **Social capital for the Ecowat investment**

Viking Venture has a very good network within service, as they previously have done a lot of co-investing with companies such as Statoil, Chevron, GE and Phillips Conoco. This network was of great importance for Ecowat as they did not have to only rely on their main cooperation with Statoil but were able to look for additional potential customers as well. The use of their network resulted in finding potential customers in the US slate market. Further, they also had great use of their network within the oil industry, specifically with operators and service companies, who contributed to the development of Ecowat’s technological solution. Thus, they used their contacts frequently, both to meet with other VC funds and corporate investment environments, getting politicians to visit the company due to the current focus on clean water and emission reduction at the time and also to identify potential customers.

#### **4.5.2 Viking Venture's investment in Chapdrive**

There were several aspects leading up to the investment in Chapdrive. One aspect was that Viking Venture had experience from an earlier investment in the wind sector, and therefore had gained a lot of knowledge, as well as having a strong network within that industry. Additionally, they were drawn to the opportunity to cooperate with Northzone, who was already an investor in Chapdrive. Finally, they also viewed the Chapdrive product to be a solution to one of the biggest maintenance issues within the wind industry, creating a way for customers to lower their maintenance costs.

Eventually, they became aware of a challenge for Chapdrive, as they began to realize: "... that many customers wanted the new technology, but because of the way wind parks are these days, large, billion projects, heavily financed by loans, it makes people unwilling to take much risk, even though they potentially could earn a lot more from it in the long run." Thus, the nature of loan financing increased the risk in the industry, making it more conservative when it came to trying out new technologies. Further, Chapdrive was dependent on a large amount of technology development, as they needed to develop a brand-new pump to accompany their technological solution. They were dependent on a pump manufacturer to establish the production of such a pump. It turned out that this manufacturer felt that the technology and market risk was too high, as they would get big investment costs themselves as well as how they questioned the actual size of the market. In the end, the pump manufacturer ended the agreement with Chapdrive. When failing to find a new pump manufacturer, the technology provided by Chapdrive would not work, and the company was dissolved in 2012.

#### **Value added for the Chapdrive investment**

Viking Venture worked similarly when adding value to Chapdrive as with their other investments, getting involved with strategy, recruitment and financing. This entailed a hands-on approach, actively engaging in everyday activities as well as board meetings. Having Viking Venture as an owner contributed positively to the recruitment process in Chapdrive, and also gave the company faster and easier access to operative and financial communities in the US. As earlier mentioned above, Chapdrive was dependent on a large amount of technology development. Thus, Viking Venture was involved in creating a deal with the pump manufacturer. They also worked with attempting to locate another potential manufacturer when the negotiation with the first one turned out to be unsuccessful.

### **Human capital for the Chapdrive investment**

At the time of investment in Chapdrive, Viking Venture could be described as a generalist fund, who used a lot of external industry expertise. There is a challenge that arises when they are treading into new fields of research or new emerging sectors, as: “(...) it is not very often we have found someone who is an expert on an area that does not exist. That is the challenge.” When developing Chapdrive, Viking Venture relied heavily on experience from their only earlier investment in the wind industry, called “Ocas”. Now they have become very focused on making use of the experience that they have, as this is an important resource in the development of their investments. From this, he also explained that Viking Venture in some ways now are “an advocate for building academic environments that becomes experts”, as there are a lot of generalists in Norway, but that they believe that it is a lot better to make a team specialized. This has become visible in how the fund now has specialized in the IT industry, achieving better results than ever before. According to him, specializing in the cleantech sector could prove to be more difficult than for IT, as cleantech is such a diverse industry.

### **Social capital for the Chapdrive investment**

Through their earlier investment in Ocas, Viking Venture had been able to build a substantial network of industry players. This network proved to be very valuable in the development of Chapdrive and was actively used throughout the investment process. Through earlier co-investments, Viking Venture had also become acquainted with the VC fund Northzone. The fact that Northzone had invested in Chapdrive 3 years earlier, in 2007, was part of the reason why Viking Venture also decided to invest in the company. Overall, Viking Venture stated to actively and frequently utilize their social capital when developing Chapdrive.

### 4.5.3 Overview case 5 - Viking Venture

Table 17 gives an overview of the value adding activities conducted by Viking Venture across all the investments in focus. The activities are also categorized according to the framework of value adding inputs presented in Section 2.4.

*Table 17: Summary of case 5 - Viking Venture*

<b>Value adding inputs and activities</b>	<b>Theoretical categorization through framework</b>
Reaching out to potential customers in their network	Outreach
Recruitment	Recruitment activities
Ownership and bonus systems	Mandating activities
Market analysis	Strategizing activities
Being the “positive”/”negative” investor	Mentoring activities
Acquire external competence	Consulting activities
Almost daily involvement	Operating activities

Table 18 below gives an overview of the Viking Venture case by highlighting the most central topics covered across all the investments in focus. The topics are also categorized according to the frameworks of human and social capital described in Section 2.4.1.

*Table 18: Relevant human and social capital for Viking Venture*

	Ecowat	Chapdrive	Categorizing
Relevant educational background	Finance & strategy	Finance & strategy	General human capital
Relevant industry experience	-	-	Industry specific human capital
Relevant work experience	Venture capital	Venture capital	Task specific human capital
Relevant networks	Oil & gas, service and operators	Wind industry	Bridging social capital

## 5 Analysis

In this chapter, the findings will be analysed using the framework established in Section 2.4. The analysis will be conducted across all five cases to look for patterns and similarities. Through applying a cross case analysis, the researchers will be able to explore how Norwegian VC funds add value to their cleantech investments through inputs and activities, as well as to which extent the different types of human and social capital is utilized in this value added.

First, all value adding inputs and activities will be divided into the following categories; 1) legitimization, 2) outreach, 3) recruiting activities, 4) mandating activities, 5) strategizing activities, 6) mentoring activities, 7) consulting activities, and 8) operating activities. Then, the importance of each category will be investigated. Next, the impact of the different types of human and social capital for each category will be discussed. The analysis is conducted using a rating system of low, medium, and high. The ratings of the different categories and aspects of human and social capital will be determined on the basis of the following three criteria:

- Frequency; how often a value adding category or aspect of human and social capital is being mentioned through all the case studies
- Impact; if a value adding category or aspect of human and social capital is stated as important by the venture capitalists during the case studies and/or has led to impactful development of the cleantech investment
- Cleantech context; if a value adding category or aspect of human and social capital is of extra importance due to specific cleantech characteristics

If a value adding category fulfils all three criteria, it will be stated as one of the most essentials ways of adding value to cleantech investments. Moreover, if an aspect of human or social capital fulfils all criteria it will be rated to have high importance, two fulfilled criteria results in a medium rating, and one or zero fulfilled criteria results in a low rating.

## **5.1 External value added**

### **5.1.1 Legitimation**

Few of the interviewees chose to focus on this category of value adding inputs when asked how they contributed to the development of their cleantech investments. Legitimation is described as a passive process of value adding (Large and Muegge, 2008), hence making it more difficult for the VC funds to be aware of their full contribution on the topic. It is likely that legitimation could be easier to identify from the startup's perspective, as it is the startup that experience the impact it causes. This could be part of the explanation of why not that many of the funds focus on legitimation when describing how they add value to their cleantech investments. The fact that legitimation is a passive contribution also makes the analysis more challenging. Thus, the three criteria mentioned above will be used in a slightly less rigid manner here than for the other value adding categories, facilitating for a more meaningful analysis.

From the findings, legitimation was identified to add value in mainly four ways. First, it was shown that additional financing was an outcome, which illustrates how legitimation could be of extra importance in the cleantech industry, as it was stated to be capital intensive. An example was how the reputation of Investinor, and the fact that they are a governmental institution gave cleantech investments more credibility when applying for bank financing, as well as increased attention among other VC funds. This outcome is dependent on bridging social capital with banks and bonding social capital with other VC funds. Second, the reputation of the VC funds contributed positively for recruitment in two cleantech investments. Further, having Viking Venture as an owner legitimated Chapdrive when they wanted to access the US market, making their entrance easier. This outcome is likely to have relied on Viking Venture's bridging social capital within oil and gas service companies, which in turn is a result of their industry specific human capital from several investments within that sector. Lastly, legitimation created value for one funds' cleantech investment through positive press coverage. Attention increased around Sorbwater's technological solution because Investinor was an investor, which resulted in several enquiries from their own industry, as well as industries who had not shown up on their initial market analysis. The impact of legitimation became evident as Sorbwater realized that their technology could also be used in fish farming, leading to positive business development in form of a new business unit within the company. An additional impact was that these

inquiries acted as networking activities for both Sorbwater and for Investinor, creating bridging social connections that could be useful in the future.

The data shows that legitimation is not frequently in focus when Norwegian VC funds invest in cleantech, as only two funds has mentioned how it has added value to their cleantech investments. The incidents that were described, show how the reputation and credibility of the VC fund can lead to positive press coverage for the cleantech investment, as well as how it can be beneficial for gaining additional financing and better recruitment. Thus, it can be argued to be essential in a cleantech context, which still only fulfils one criterion. These outcomes have been largely dependent on bridging social capital, bonding social capital and industry specific human capital, making them most frequently utilized for this category. Social capital increases the probability of banks or other funds having heard of the VC fund and perceive them as solid, which the benefits from legitimation are dependent on. VC funds with expertise in a specific industry will also likely be seen as extra competent in developing firms within that sector. As a contrast, neither social capital nor industry specific human capital was stated by the interviewees to have particular importance for legitimation. Still, all three criteria are fulfilled as it can be argued that industry specific human capital and bridging social capital led to events of positive business development. Thus, they both receive a high rating. Further, the overall reputation of a VC fund is likely to be positively affected by the general and task specific human capital of their venture capitalists in form of education and extensive VC experience. This can also relate to the cleantech challenge of high risk and uncertainty, as backing by a solid VC fund can reduce the perceived uncertainty of a venture, but because they were not stated as essential for legitimation or led to impactful development, both get medium ratings. The importance of each aspect of human and social capital in the value added through legitimation is shown in Table 19 below.

*Table 19: The importance of human and social capital for legitimation in cleantech*

	General human capital	Task specific human capital	Industry specific human capital	Bonding social capital	Bridging social capital
Legitimation	Medium	Medium	<b>High</b>	Medium	<b>High</b>

### 5.1.2 Outreach

All VC funds were found to conduct outreach activities in various forms for their cleantech investments. Most commonly was obtaining additional financing, but examples of reaching out to potential customers and suppliers were also found. Additionally, some funds proactively engaged in accessing knowledge of industries and relevant policies.

One of the most frequently conducted outreach activities was securing additional funding for their investments. All funds described working to secure the commitment of co-investors, while some also described securing bank funding. Securing additional financing is closely connected to bonding human capital, as it is driven by ties to other investors, thus people or groups that are *like* you in some way (Putnam, 2007). It may seem like the activities connected to securing additional finance frequently draw on a funds' bonding social capital, as it builds on connections between different VC funds, or companies investing in startups in a similar manner to VC funds. An example is the investment in Chapdrive by Northzone, where they reached out to and arranged for Statoil and Hafslund to co-invest. When describing how to find these co-investors, the interviewee stated that they actively used their network. This network can be described as a combination of bonding and bridging social capital. The bonding aspect being the common competency regarding investing in venture companies, and the bridging aspect being the fact that Statoil and Hafslund are oil and energy companies, not pure VC funds. Another example of how bonding social capital has a large impact on outreach is how part of the reason why Viking Venture decided to invest in Chapdrive was because they had a good relationship with Northzone, who had already invested in the company. Thus, Northzone encouraged the co-investment of Viking Venture through utilizing their bonding social capital.

Some of the funds also described reaching out to different types of stakeholders with the goal of obtaining different forms of knowledge. Investinor explained how they pull in several types of external assets from the industry, general advisor communities, or through their network in general to help understand and develop their investments. An example of bridging social capital used in outreach activities is how the responsible for Sorbwater at Investinor used his network from the time in the oil industry to gain useful knowledge from contacts there. Another example is how Viking Venture reached out to both the Norwegian Environmental Agency and the research council of Norway when trying to understand the nature of the

regulations that were relevant for their investment in Ecowat. Investinor also explained how they had the ability to contact and arrange meetings with the decision-making bodies in charge of the legislative developments in the cleantech sector. Due to the fact that the cleantech market is so heavily defined by policies, collecting information about these through outreach is considered to have extra importance. To arrange meetings with industry assets or policy makers, VC funds rely heavily on their social capital, and here more specifically their bridging social capital. Still, in the Televenture case it was stated that the venture capitalists' general and industry specific human capital was more important than network because it gave the advantage of being more able to correctly analyse support regimes. Thus, proving that these two aspects of human capital have an impact as well.

Other identified examples of outreach activities were reaching out to customers, suppliers and other types of cooperation partners. An example is how one case contributed through using their network to identify and facilitate for potential industry buyers. This has also been done on the other side of the supply chain, as Investinor reached out to Swedish suppliers for Kebony. These activities draw upon the funds' bridging social capital, which in the case of Investinor stems from the venture capitalist's time working within forestry. Further, the regulative nature of cleantech also impacts the way Norwegian VC funds conduct outreach activities. An example is how the investment manager from Sintef TTO explained how very distinct regulations often lead to fewer potential buyers, and often to public buyers, which can make outreach more difficult: "And if the fund is not able to secure buyers who are willing to purchase their investment's product it can be devastating". This stated example illustrates how the lack of buyers resulted in fewer investors being willing to take part in the investment rounds, indirectly making it more difficult to secure co-investors. This turned out to be a critical event, as Ecowat was dissolved mainly due to the lack of co-investors, showing how VC funds investing in cleantech need to be even better at outreach in order to overcome such challenges.

To conclude, it seems like outreach activities in general are frequently conducted, especially securing co-investors, which is carried out by all of the funds. Securing co-investors is also viewed as very important by the venture capitalists, and the fact that lack of co-investors in one case was said to lead to an investment being dissolved, proves the stated importance of outreach activities. Overall, the findings have shown how cleantech is capital intensive and thus, how securing additional finance is of extra importance. Seeing how policies and

regulations play such a large role in cleantech, it also entails that outreach in the form of gathering knowledge is particularly crucial in this context. The same goes for the often-limited number of potential buyers and reaching out to these. Thus, outreach ticks all the criteria, and is considered to be a very important value adding activity.

It seems that bonding social capital is often being used when securing co-financing, while bridging social capital also is frequently used to contact bodies of knowledge, potential buyers and suppliers, and policymakers. Due to the challenges posed by the cleantech market, the high value of this bonding and bridging social capital becomes visible. Several of the interviewees also stated the importance of their network when conducting outreach activities. Thus, bridging and bonding social capital are both rated as high. One case stated general human capital to be important, and it also proves to have particular impact in a cleantech context, as education and experience from politics is helpful when evaluating policies and regulations. Still general human capital is not mentioned frequently throughout the cases, thus, receiving a medium rating. Industry specific human capital also gets a medium rating, as it can be argued that contacts within an industry is a result of previous work experience. Further, this was shown to be crucial in one case when they had to move into a different market and the VC fund utilized their contacts from working with service companies. Task specific human capital ticks zero of the criteria, receiving a low rating. The rating of each aspect of human and social capital in the execution of outreach is shown in Table 20 below.

*Table 20: The importance of human and social capital for outreach in cleantech*

	General human capital	Task specific human capital	Industry specific human capital	Bonding social capital	Bridging social capital
<b>Outreach</b>	Medium	Low	Medium	<b>High</b>	<b>High</b>

## **5.2 Internal value added**

### **5.2.1 Recruiting activities**

All case funds carried out recruiting activities, either through finding board members, CFOs or CEOs, building the initial team or replacing existing members of the team such as the original general manager. Further, only one VC fund described actively using recruitment bureaus, while the other four stated to rely mainly upon their own network to reach out to a wide range of people. Thus, to be able to recruit people of different backgrounds and from different industries, the VC funds primarily rely on their bridging social capital in order to be successful.

Building the initial team was described as an important aspect of recruiting by several of the funds. Both Northzone, Televenture, and Investinor described it as one of the most important aspect of recruiting, with Northzone going one step further; claiming that it was the most important thing they did for Chapdrive. This was because they did not see themselves as wind experts and thus securing the needed expertise through recruitment from Vesta was crucial. One interviewee from Investinor also argued for the significance of building the initial team due to many venture capitalists being generalists. Thus, it is of great importance for them to gather a good team in order to obtain the right knowledge for their investment. It may seem like it is the VC funds' lack of internal industry specific knowledge that makes this value adding activity especially useful, as it creates the foundation of knowledge and experience that the investment will be built from. As Northzone, Televenture and Investinor used their own network to recruit the initial team for their investments, it further underlines the importance of bridging social capital as an important contributor to successful recruitment. Additionally, for Televenture this led to the critical event of pivoting Hystorsys into the European instead of the Norwegian market, due to insights given from a recruited sales asset.

Recruiting activities are also impacted by the characteristics that define the cleantech industry. According to Sintef TTO, when investing in industries that has a certain distinctiveness, recruiting people with relevant experience is crucial. Thus, it seems like being able to recruit people with the right niche competence is key when adding value to a cleantech startup. The partner from Viking Venture also exemplified this issue by pointing out how there was a lack of specific niche competence in their Ecowat investment, and that this was directly related to recruitment. Consequently, it appears that in addition to bridging social

capital having an impact on recruitment activities, industry specific human capital can also play a crucial role. By knowing what characteristics that define an industry, it will be a lot easier to forecast which capabilities a potential candidate will need to be a successful recruitment.

Overall, every case did recruitment and highlighted it as one of the most important value adding activities, with some also claiming it to be the most essential one. Additionally, several examples of recruitment resulting in positive development of the investment was found. Thus, recruitment is one of the most crucial value adding activities when investing in cleantech. Further, it mainly involves the use of bridging social capital, which is frequently utilized in recruitment throughout the case studies. Several venture capitalists also claim that their network with industry players is of high importance when recruiting. Additionally, bridging social capital seem to be of extra importance in the cleantech sector, as many funds are generalists, and cleantech startups are in need of niche competence from the industry which can be accessed through such connections. Thus, bridging social capital fulfils all three criteria and is graded high. Industry specific human capital has also been shown to have an impact, as well as particular relevance in the cleantech sector by how it is easier to recruit the right niche competence if you know what the industry needs. Thus, industry specific human capital is graded as medium. The other aspects of human and social capital are graded as low due to not fulfilling any criteria. The importance of each aspect of human and social capital in the execution of recruitment activities is shown in Table 21 below.

*Table 21: The importance of human and social capital for recruitment in cleantech*

	General human capital	Task specific human capital	Industry specific human capital	Bonding social capital	Bridging social capital
<b>Recruitment activities</b>	Low	Low	Medium	Low	<b>High</b>

### **5.2.2 Mandating activities**

Mandating activities are defined as VC funds generating value for their investments by focusing the management team on key performance indicators and preventing distracted undertakings (Large and Muegge, 2008). Few of the VC funds unsolicitedly described how they were involved in activities that can be defined as such, with one even explicitly stating not to carry out such activities. Northzone was the only case which unsolicitedly explained how they engaged in creating a concise milestone plan for one of their cleantech investments. Additional evidence of mandating was found through direct questions; Investinor's bonus and share options systems, as well as how Viking Venture incentivized employees through ownership and bonus systems. It can be argued that task specific human capital is beneficial when putting down and following up on milestone plans and such schemes, related to the work of creating them. Further, for the milestone plan to be designed realistically and contributive for success, it is likely that industry specific human capital is also needed.

Several of the funds mention how they believe that cleantech entrepreneurs and startups can be too focused on the environment and sustainability, pushing the startup in a different direction than what the VC fund prefers, creating more "social value" than monetary value. These cleantech "evangelists", as one interviewee call them, often lack financial experience and fail to understand the actual needs of the market. As a result, VC funds investing in the cleantech sector are at risk of experiencing a misalignment between their own goals and the goals of the entrepreneur. Thus, one can draw the conclusion that mandating activities may be more important in the cleantech sector than in others. This also underlines the importance of focusing on both task specific, and industry specific human capital in the business development of cleantech startups.

The little evidence of mandating activities for Norwegian cleantech investments may indicate that the focus of venture capitalists' value added lies elsewhere and that it is not something they perceive as essential. Thus, only the criterion of cleantech relevance is fulfilled for mandating. From what is shown, it seems like task and industry specific human capital are frequently used by the funds in the cases that actually state to conduct mandating activities. In addition, it can be argued that these two aspects of human capital are needed in a cleantech context, in order to be able to create goal alignment with sustainability evangelists. As a consequence, both mentioned aspects of human capital are graded as medium. The analysis

shows little impact of general human capital, as well as both types of social capital, resulting in gradings of low. The importance of each aspect of human and social capital in the execution of mandating activities is shown in Table 22 below.

*Table 22: The importance of human and social capital for mandating in cleantech*

	General human capital	Task specific human capital	Industry specific human capital	Bonding social capital	Bridging social capital
Mandating activities	Low	Medium	Medium	Low	Low

### **5.2.3 Strategizing activities**

All five VC funds described carrying out strategizing activities for their cleantech investments. The focus of these activities was mainly on investigating the market, working on business models and concepts, as well as considering how to respond to relevant regulations.

Conducting market analyses seem to be one of the most common strategizing activities for Norwegian VC funds investing in the cleantech sector. This involves task specific human capital, but also industry specific human capital due to how it is essential to have an understanding of the specific characteristics of the cleantech context. Three of the case companies state the importance of good market analyses particularly for cleantech, underlining strategizing as a frequent and essential contribution. Both Sintef TTO and Viking Venture emphasize the importance of being absolutely certain that there exists a market for their investment's solution, thus referring to the high market risk in the cleantech sector. As stated by Viking Venture, the risk is incredibly high if there is not an existing market. Still, they did explain that they worked on carrying out a market analysis, which reveal how they might have lacked industry specific human capital within cleantech and especially purified water at the time. Investinor on the other hand, stated that they could actually contribute with market understanding to their cleantech investment Keep-it, due to how quite a few people at Investor have industry specific human capital within aquaculture. However, at the same time they explained that for their next cleantech investment they would focus on the importance of being able to see through market hypes, which is likely to depend on their industry specific human capital.

Creating business concepts falls within the strategizing category (Large and Muegge, 2008). From the empirical findings it was revealed that three of the case companies had been involved in changing the business model for their cleantech investments. Sorbwater is an example, by how Investinor decided they should focus on the chemical part of the technology, due to how time-consuming hardware would be. To arrive at this decision, it is very likely they would have had to use industry specific knowledge in form of market insight on how the chemicals could meet a need in the oil and gas sector. Ecowat is another example of a cleantech investment which pivoted into a different market, going into frack-flowback in the shelf oil production in the US. In doing this they used bridging social capital in form of their network within oil service. Viking Venture has done several investments together with service companies like Statoil, Chevron and GE, which was then a very beneficial network to have. Thus, their industry specific human capital led to a very useful social bridging capital within oil and gas, which they stated to be of importance. Keep-it was not pivoted into something else, but they were pushed towards going for the seafood sector, due to Investinor's experience and competence within that industry, and they stated that they did have good use of their experience and competence from investments within the same industry. This further highlights the value and impact of industry specific human capital.

The regulations and policies impacting cleantech, also need to be taken into account when doing strategic planning. Two of the case companies carried out extensive screening of the startup before doing the investment. This seemed to be an important foundation for their strategic plans of the cleantech investments. All case companies regarded policies and regulations as something involving high risk and uncertainty, underlining the importance of strategizing and industry specific human capital. Thus, it can be argued that for cleantech, industry specific human capital in form of understanding regulations, and having experience with them, is of importance when investing. Northzone explained how they tried to understand the regulations, but it was difficult for them to concretize the element of risk, even though the Northzone interviewee has industry specific human capital in form of experience from working as a political advisor. The Televenture partner on the other hand, stated that his general human capital within political science proved beneficial in helping him evaluate new regulations and policies, understanding what the government will actually go through with or not.

Overall, strategizing seems to be one of the most common ways Norwegian VC funds add value to their cleantech investments, as every case stated to conduct such activities. Further, strategizing was stated to be important in the development of several of the funds and it seems like it is of extra importance in the cleantech sector, due to among other things the high market risk. Thus, strategizing fulfils all three criteria, and is considered to be one of the most central value adding activities overall. Industry specific human capital is being graded as high, due to the fact that its importance has been stated by different cases and it has been frequently mentioned. Additionally, it relates well to how cleantech is highly regulated and involves several types of risk. Further, bridging social capital was stated as important in several cases, often connected to how networks were frequently used to discover opportunities in other industries. This also proves to be particularly important for cleantech due to the high market risk which often force companies to change focus area quickly. Thus, bridging social capital is graded as high. Task specific human capital was indirectly mentioned by several of the cases to be important, especially when conducting market analyses. Thus, it is believed to be used frequently for this strategizing activity, as well as having cleantech relevance due to the importance of market insight, giving it a medium rating. Bonding social capital and general human capital seem to be of low importance, as no examples were given of this being utilized for strategizing, and as such, no criteria fulfilled. The importance of each aspect of human and social capital in the execution of strategizing activities is shown in Table 23 below.

*Table 23: The importance of human and social capital for strategizing in cleantech*

	General human capital	Task specific human capital	Industry specific human capital	Bonding social capital	Bridging social capital
<b>Strategizing activities</b>	Low	Medium	<b>High</b>	Low	<b>High</b>

#### **5.2.4 Mentoring activities**

Mentoring the team in an investment involves giving guidance, coaching and contributing to motivation (Large and Muegge, 2008). Overall, only three funds have explicitly stated to conduct mentoring activities. Still, the data reveals that some other funds also add value through mentoring to some extent. From all the cases it was shown how especially Televenture seem to do a lot of mentoring in form of both coaching and motivating their cleantech investments. It was stated that they contribute by steering the team's focus when they need to be a bit more forward leaning and confident. For instance, if Televenture sit in on meetings, they have task specific human capital that help them realize whether the other party is actually interested or not, which was stated not to always be easy for the venture team to understand.

Another aspect of mentoring is how two of the funds explained that it is common for them to have two people working on an investment case, with each person taking on different roles. Both Televenture and Viking Venture said they usually have one person taking on the role of being "the positive" person and the other being "the negative" person towards the team in their investment. Thus, being able to both challenge the team as well as providing motivation, by consciously acting in a specific manner. Additionally, Investinor emphasised that they also have different roles where one takes on the role of being a critical sparring partner, deliberately challenging the others who are involved in the investment. This person could ask critical questions, but also give good advice, which is part of adding value through mentoring. Even though these activities mainly build on task specific human capital, being able to ask useful critical questions also need industry specific human capital in order to be helpful in a specific context such as cleantech.

Overall, three of the case companies have mentioned aspects of mentoring to a larger degree than the other cases. Thus, it has only to some extent been frequently talked about. It is a more informal way of providing support, and as such, could be something not everyone realizes they contribute with. The empirical evidence implies that the most widely used way of mentoring is through coaching, by being a sparring partner both in a positive and critical way. There are few indications of this category being an essential way of adding value, as it has not been stated to have significant importance by the cases or can relate to specific cleantech challenges. Further, the findings indicate that task specific human capital is needed

to conduct mentoring, but it was not found to have particular cleantech relevance or stated to have importance, resulting in receiving a low grading. Industry specific human capital was highlighted in relation to asking critical questions. Thus, it is likely to have been frequently used in mentoring due to the complexity of the cleantech context. It is therefore given a medium rating. General human capital and any aspect of social capital have not been implied as relevant by how it has not been mentioned at all. Thus, receiving low gradings. The importance of each aspect of human and social capital in the execution of mentoring activities is shown in Table 24 below.

*Table 24: The importance of human and social capital for mentoring in cleantech*

	General human capital	Task specific human capital	Industry specific human capital	Bonding social capital	Bridging social capital
Mentoring activities	Low	Low	Medium	Low	Low

### **5.2.5 Consulting activities**

Consulting activities can be viewed as contributions from ‘outsiders’ through venture capitalists providing structured knowledge in a formal way (Large and Muegge, 2008). For this study, gaining insight and help from outside experts falls into this category, as explained in Section 2.4.1. All case companies but one mentioned acquiring external expertise from consultancy agencies, making it a frequent contribution of value added. Often the VC funds got reports on the industry and market, in order to gain insight from the industry specific human capital they themselves lacked. Findings also show how consulting was utilized both for the business and market aspects of developing the company, as well as sometimes the more technological features. The complexity and several specific challenges found in the cleantech context, combined with the fact that VC funds often tend to be generalists, highlights the importance of this category.

Viking Venture used external help in recruiting for Ecowat, using a recruitment bureau. For this, they used task specific human capital in providing the bureau with a requirement specification for what people they wanted for Ecowat. Further, they also stated that they used to hire a lot of external experts, but not so much anymore as they have become a very

specialized VC fund. From this, it is likely they are less reliant on external expertise by how they now have industry specific human capital within the B2B subscription-based software segment. On the other hand, for Investinor it seems that they now have stronger industry specific human capital within cleantech, which acts as motivation for investing in this industry again. It was stated that the experiences they have made investing in this segment have made them even more capable of doing evaluations within cleantech. Still, it was also mentioned that for their future cleantech investments, whenever they themselves lack the right competence and experience, they need to be even better at finding the right communities to provide it. This statement also underlines the importance of bridging social capital in relation to external expertise. Further, it has been mentioned how only one of the case companies has their own in-house consultants, which was stated to be an advantage in the day-to-day teamwork discussions, having the competence and experience always there. One of the main advantages of having in-house consultants was “how these people have a network of relations that can be very convenient.”, thus contributing to the VC fund’s bridging social capital.

Several findings exemplify how the VC funds hire consultants when they themselves lack the required industry specific human capital. For some cases it seems to be a connection between internal industry specific knowledge and experience, and the use of outside consultants. The responsible for Kebony at Investinor had extensive industry specific human capital within forestry, and little evidence was found in the empirical findings of Investinor using external consultants themselves on this investment. It was explained how he himself did an analysis on potential factory locations, which can be argued to require both industry and task specific human capital. Further, the responsible for Keep-it at Investinor had industry specific human capital within aquaculture, and there was no use of consultants mentioned for that investment either. Still, the Sorbwater interviewee had extensive experience from oil and gas, but in this case, they ordered a market report from the consultant agency Arkwright. Nevertheless, he gave them several of his contacts (bridging social capital) from his time in the oil industry. For the Investinor investment in Havgul, they had a need for market understanding and information on the Norwegian, Swedish and American engineering wind market, which they hired external expertise to provide them with due to how none of them possessed the required knowledge and experience on this field. From the empirical findings, it seems that those with industry specific experience and knowledge valued it highly, and believed it was an advantage, especially on a day-to-day basis, while those who lacked it did not state it as a problem because they are good at acquiring external expertise. Thus, the use of consultants

might seem to relate to industry specific human capital seeing as the lack of it often results in hiring external industry expertise.

It has been shown that Norwegian VC funds very frequently acquire the help of external experts such as consultants when working to develop their cleantech investments. Moreover, they stated this to be important due to how they themselves cannot be experts at everything and are generalists. This also underlines its relevance in a cleantech context, fulfilling all three criteria, resulting in a high rating. Further, the need for industry specific human capital has been connected to cleantech relevance, as well as being frequently used in this category. Additionally, it was shown to have importance through the venture capitalist who was able to carry out structured support in form of a self-made market report. Thus, grading it as high. If industry specific human capital is present, task specific human capital is also needed to carry out formal analyses. Thus, it is graded to have medium importance. It seems like some of the funds have a rather close relationship with their external resources, which is likely to be dependent on their bridging social capital. Further, when lacking inhouse competence, the bond to external resources becomes particularly important, due to the funds' dependency of the knowledge that they receive. Thus, bridging social capital is given a medium rating. Bonding social capital and general human capital seem to have low importance for consulting activities by how it was neither mentioned, stated to be important or relate to cleantech characteristics in this category. The importance of each aspect of human and social capital in the execution of consulting activities is shown in Table 25 below.

*Table 25: The importance of human and social capital for consulting in cleantech*

	General human capital	Task specific human capital	Industry specific human capital	Bonding social capital	Bridging social capital
<b>Consulting activities</b>	Low	Medium	<b>High</b>	Low	Medium

**5.2.6 Operating activities**

From the empirical findings it became evident that several of the case companies engage in operating activities. All the VC funds see themselves as active investors and are therefore involved in many aspects of their investments in a hands-on manner. Three of the five

different case companies explicitly stated that they were participating almost on a day-to-day basis for their cleantech investments. However, there are some different views on whether value adding happens mostly through the board or not. The interviewee from Sintef TTO explained that for early phase companies which starts on bare ground, the board is very active, and its members are “an important part of its development at all times”. Televenture on the other hand, stated that most of the work in reality happens in between board meetings. Still, a board is an important decision-making forum, and for a cleantech context, industry insight is likely to matter in order to make the right decisions. General board tasks could be more reliant on task specific human capital, as it can be considered a skill that one gets better at with experience. The fact that venture capitalists typically hold seats in a large number of boards throughout their career entails that this is a skill particularly connected to working in a VC fund, thus being considered task specific.

It seems like all case companies perform the operating activity monitoring on their cleantech investments. Not all state this specifically, but the empirical findings show how they all do follow-ups and pay attention to what is going on for their cleantech investments. Two of the VC funds show evidence of why industry specific human capital could be of particular importance to this specific value adding category. One fund stated to double-check the state of their investment on a weekly basis. To do this successfully, it is likely that utilizing industry understanding and insight in order to correctly double check various aspects of the situation of the cleantech investment is essential. Another VC fund provides evidence of how industry specific human capital can be important in regard to being correctly informed, exemplified by how “... the less we know from before, the more dependent we are on receiving information from the company itself.” As mentioned, several of the case interviews revealed that often the startup and entrepreneur are overly positive in their evaluations, thus industry specific human capital could help in getting a more correct and realistic view of things.

Controlling and active planning are other operating activities which most of the case companies seem to engage in when investing in cleantech. This can be related to risk, which it seems all case companies believe is especially high for cleantech investments. Viking Venture highlights the importance of understanding project management and the remaining risk as important capabilities for an early stage investor. The task of planning and controlling projects, as well as doing risk analysis is likely to require task specific human capital. Still, it

is also likely that industry experience can contribute to a better realization of remaining risk, as it can be easier to recognize risk if you have experienced something similar before. This again relates to the importance of industry specific human capital.

Overall, all case companies seem to have been engaged on an operative level in their cleantech investments, some to a larger extent than others. Still, there was no mention of this activity being particularly essential and it does not directly relate to having importance for cleantech. Thus, it is not concluded to be one of the most central value adding categories. Further, it has become evident that task specific human capital is frequently used, as it is essential when conducting board related tasks, combined with the fact that all of the funds hold board positions in their investments. Moreover, task specific human capital is considered important by several venture capitalists, as the work done by the board is considered an important source of development, overall giving it a medium rating. Industry specific human capital seem to be both frequently used, as well as stated to be important for being able to confirm that information the funds receive from their investments actually is correct. Further, industry specific human capital is of particular importance in the cleantech sector, as efficient controlling and active planning seem to be reliant on the VC fund understanding the particular risks connected to the industry. Thus, giving industry specific human capital a high rating. General human capital, as well as both aspects of social capital have all generated few findings in relation to this category, thus receiving a low grading. The importance of each aspect of human and social capital in the execution of operating activities is shown in Table 26 below.

*Table 26: The importance of human and social capital for operating in cleantech*

	General human capital	Task specific human capital	Industry specific human capital	Bonding social capital	Bridging social capital
Operating activities	Low	Medium	<b>High</b>	Low	Low

### 5.3 Summary of analysis

This analysis has shown how outreach, recruitment, strategizing, and consulting seem to be the most essential value adding categories for Norwegian VC funds investing in cleantech. The overall importance of industry specific human capital in adding value to cleantech investments has become evident, as well as the significance of bridging social capital. The other aspects of human and social capital have been found to be less central, but it is emphasised that this is on a relative scale, with for instance general human capital being of less direct importance than industry specific human capital in a cleantech context. Overall, general human capital is considered to be important in general, by acting as a building block for other aspects of human and social capital. However, it is considered to have a relatively lower importance than other factors in the cleantech context. Still, it is worth mentioning that some types of general human capital such as education within politics have proven to be central in this context. The value adding categories found to be more essential than others are emphasised in bold and whenever an aspect of human or social capital was found to have extra relevance for a category by being rated as high, it is also presented in bold. The combination of a central value adding category and an important type of human or social capital is highlighted with background colour to pinpoint the most significant results of the analysis. In the next chapter, the findings and analysis will be discussed and compared to existing literature in order to answer the thesis' research questions. Table 27 below gives a summary of the results of the analysis.

Table 27: Summary of the analysis

	General human capital	Task specific human capital	Industry specific human capital	Bonding social capital	Bridging social capital
Legitimation	Medium	Medium	<b>High</b>	Medium	<b>High</b>
<b>Outreach</b>	Medium	Low	Medium	<b>High</b>	<b>High</b>
<b>Recruiting</b>	Low	Low	Medium	Low	<b>High</b>
Mandating	Low	Medium	Medium	Low	Low
<b>Strategizing</b>	Low	Medium	<b>High</b>	Low	<b>High</b>
Mentoring	Low	Low	Medium	Low	Low
<b>Consulting</b>	Low	Medium	<b>High</b>	Low	Medium
Operating	Low	Medium	<b>High</b>	Low	Low

## 6 Discussion

In this chapter the authors will answer the research questions, by discussing the findings in light of existing literature on both cleantech and value added. The analysis has revealed several ways Norwegian VC funds add value to their cleantech investments and investigated the contribution of human and social capital. Overall, it has been shown that cleantech involves certain characteristics which are important to take into account for VC funds investing in such ventures. The research questions will be discussed in turn, resulting in the presentation of propositions when applicable.

### 6.1 Answer to RQ1

Research question one aims to answer *how Norwegian VC funds add value to create business development in their cleantech investments*. Through the analysis of empirical data, it has been revealed that Norwegian VC funds add value to their cleantech investments through all value adding categories from the framework. In the following paragraphs, the business development related to the added value will be described, with four activities being the most essential, one giving a moderate contribution and lastly, three categories not found to directly relate to business development.

#### **Outreach, recruiting, strategizing and consulting - high impact on business development in a cleantech context**

These four activities were found to be the most central ways Norwegian VC funds add value to their cleantech investments. Outreach, recruiting and strategizing were present in all five cases and consulting was found in all but one case. Further, all four categories were stated as important by the venture capitalists and had extra relevance in the cleantech context. These findings are further backed by (Gorman and Sahlman, 1989), who state that the three most critical services the VC funds give to their investments in addition to funding are building the investor group, reviewing and support in formulating the business strategy and filling the management team. Large and Muegge (2008) also found outreach and recruiting to be two of the five most influential value adding inputs for VC funds in general. Lastly, a range of articles pinpoint advising to be particularly central in the development of portfolio investments (Cumming, 2010, Gorman and Sahlman, 1989, Hellmann and Puri, 2002, Kaplan and Stromberg, 2004). The definition of advising varies slightly between the different articles,

but generally corresponds well to the category consulting from the framework used in this paper. When combining the results from this thesis with the existing literature it seems like VC funds should focus on roughly the same value adding activities whether investing in the cleantech context or not. Still, the activities seem to be conducted in a somewhat different manner for cleantech, due to the industry's set of specific characteristics.

Outreach led to additional financing from other VC funds, banks, innovation institutions and industry incumbents, as well as giving access to potential suppliers and a potential industry buyer. Gaining an industry partner led to business development of the cleantech investment in form of securing much needed capital and relevant industry knowledge. Recruitment was found in form of initial recruitment of CEOs, replacing existing ones, building the initial team and recruiting board members. This resulted in business development through securing relevant technology and business competence, as well as market insight, exemplified by the realization of which market to aim for. Further, strategizing resulted in a new business concept for a cleantech investment, and in pivoting some ventures into new markets. This was often a reaction of an event or factor such as new competition, changes in policies and regulations, or insight into what the industry actually needed. Moreover, consulting activities resulted in business development through marketing reports providing the VC funds and their investments with insight and relevant knowledge. However, there was only one case where such a report was written by the venture capitalist himself. One case also stated to use a recruitment bureau when looking for appropriate employees. This way of adding value provides the funds with the competence, knowledge and insights they themselves lacked when investing in cleantech.

### **Legitimation - moderate impact on business development in a cleantech context**

Legitimation contributed to business development in form of the creation of a new business unit, obtaining bank financing and attracting co-investors. The importance of such contributions is further underlined by theory. Nanda (2010) refers to the difficulty new technology ventures have with obtaining traditional bank debt financing, hence would this be a useful contribution. Further, financing by VC funds can be perceived as a signal of quality (Large and Muegge, 2008), which is essential due to the uncertainty and risk of cleantech startups.

### **Mandating, operating and mentoring - low impact on business development in a cleantech context**

Little evidence of business development was found for these activities, with no specific examples identified from either of them. Still, for mandating it could be more difficult for the venture capitalists to see and realize what the outcome of bonus systems and share options have been, which should have been that the employees in the cleantech investments reach milestones and goals. Thus, even if it has not been mentioned explicitly, it is likely that this input has contributed to the employees being more target focused. The same goes for operating activities, which were frequently conducted by the funds, but for which it can be argued is not of particular relevance in a cleantech context. This stands in contrast to how the general VC literature names monitoring; a subcategory of operating, to be one of the most central value adding activities ((Ehrlich et al., 1994); (Denis, 2004); (Gorman and Sahlman, 1989)). Mentoring follows along the same lines, as the positive impact it contributes with is more general and difficult to concretize into specific examples of business development.

## **6.2 Answer to RQ2**

Research question two aims to answer *how Norwegian VC funds utilize their human and social capital when adding value to their cleantech investments*. Norwegian VC funds utilize all categories of human and social capital when adding value to their cleantech investments. Bridging social capital, bonding social capital and industry specific human capital have been most frequently applied in the cases. The venture capitalists' general human capital seems to be utilized in a more unconscious way but is still likely to positively contribute to value added. Further, as they all have extensive experience from working with venture development, task specific human capital has been highlighted, although more subconsciously. In the following paragraphs, each aspect of these resources will be discussed in order to answer RQ2.

### **Bridging social capital**

Bridging social capital was found to be widely used in the development of cleantech investments. Casson and Martin (2007) describe how VC funds use their contacts to create networks of customers, professionals, suppliers and also other financing sources. Further, Meglio et al. (2017) state that VC funds contribute by arranging for the investment to get access to necessary resources and capabilities by legitimating and helping them make contact

with actors in their own network. This is further supported by the authors' findings as they show that VC funds have used bridging social capital to connect their investments to both potential buyers and suppliers. Additionally, several of the cases used their networks for recruitment, which relates to accessing needed capabilities. Overall, bridging social capital was utilized in business development when obtaining additional financing, cooperation with industry incumbents, recruitment and providing access to potential buyers and suppliers. Further, the literature presents a lack of network within cleantech to be one of the central reasons for lack of VC funding (Bocken, 2015). Thus, the papers findings, and the existing literature agree on the importance bridging social capital for VC funds investing in cleantech. The first proposition then becomes:

*1) Bridging social capital is of particular importance for VC funds investing in cleantech*

### **Bonding social capital**

There was also found to be a widespread utilization of bonding social capital. Almost every case stated to use their network of other VC funds, mostly for gaining co-investors. This contributed to additional financing, as well as the human and social capital those venture capitalists would add in the development of the joined investment.

### **General human capital**

General human capital does to some extent play a role in a couple of the value adding inputs, acting as a building block for the other types of human and social capital. Still, it is not considered equally important in the view of this analysis. Three of the cases explained how the general human capital from their educational background was utilized in their work on cleantech investments. One utilized his political understanding, while another carried out economic analyses, as well as using his knowledge from studies within marketing and international business. Additionally, one fund had venture capitalists working on cleantech investments corresponding more directly to what they had competence on from previous education.

### **Task specific human capital**

All the interviewees were experienced venture capitalists with a lot of task specific human capital from previous investments, which they transferred to their cleantech investments. Examples are carrying out market analyses and organization of milestone plans. Knockaert et al. (2006) state that human capital such as previous consulting or entrepreneurial experience is the most important factor for success. Two venture capitalists from the same fund in this study have consulting experience, but there is no evidence of such experience being the most important in this thesis on cleantech investments. Still, it is concluded that task specific human capital, especially from previous VC investment processes has a mentionable importance for several value adding inputs.

### **Industry specific human capital**

Industry specific human capital clearly lacks for several of the cases, as shown in the summary tables in Chapter 4. Only one case describes how they made investments in industries where they themselves have specific and relevant industry experience. In this one specific VC fund, all three interviewed venture capitalists had industry specific human capital. They utilized it through having an understanding and knowledge of the industries, as well as utilizing the networks that they built during their time in the industry. As mentioned, most of the Norwegian VC funds that have invested in cleantech are generalists, which seem to be an important finding especially when looking at what the current VC literature states. Meglio et al. (2017) propose that previous experience in a certain ecosystem matters, as the venture capitalists' coaching capability improves with the number of ventures they have backed within an industry. Further, the study by Knockaert et al. (2006) shows that specialization in industry focus by the investment manager has a positive impact on value added. Dimov and De Clercq (2006) found that the prospect of new venture failure is reduced when the VC fund "brings knowledge relevant to the specific situation of the venture". Thus, showing that the importance of industry specific human capital is emphasized in the literature. This could point towards a gap between the need for industry specific human capital for cleantech investors, and the current lacking of this in Norwegian VC funds.

Still, the author's findings on whether industry specific human capital was beneficial or not was not definite. Some interviewees stated not to lack any kind of knowledge as they would attain it externally, while those who had industry specific human capital saw it as very beneficial. Overall, most cases do not think they lacked any particular knowledge for

investing in cleantech, because almost all hire external competence. Still, Viking Venture believe they are more successful now that they have become a niche fund. According to Casson and Nisar (2007), active investors entail considerable returns, especially when the investors have important expertise in the areas they invest in. Hence, the literature suggest that specific expertise can be important for venture capitalists and following the example of Viking Venture as a niche VC fund, perhaps a specialized cleantech VC fund is needed to meet the challenges and mitigate the mismatch. Thus, the second proposition becomes:

*2) Industry specific human capital is of particular importance for VC funds investing in cleantech*

### **6.3 Answer to RQ3**

Research question three aims to answer *how human and social capital impact the most important value adding categories in a cleantech context*. Overall, two resources have been rated to have high importance in the largest number of value adding categories. Bridging social capital is of high importance for legitimation, outreach, recruiting and strategizing, while industry specific human capital is crucial for legitimation, strategizing and consulting activities. Additionally, bonding social capital is also graded as high for outreach activities. In the following paragraphs, the most important combinations of value adding inputs and types of human and social capital in a cleantech context will be presented.

#### **The importance of outreach and social capital in the cleantech context**

Cleantech is very capital intensive according to both existing cleantech literature, as well as this study's findings, which highlights the importance of securing co-investors. The existing literature also highlight outreach activities to be one of the most central ways of adding value (Large and Muegge, 2008, Gorman and Sahlman, 1989). Thus, the author's findings coincide with what earlier studies on value added has found. Both Bocken (2015) and Georgeson et al. (2014) relate the use of co-investors to reducing risk, which is beneficial when investing in cleantech, as it was stated to be particularly risky investments by all cases. The social value of cleantech is another challenge which was presented in existing studies, as it can act as a barrier for gaining co-investors. Venture capitalists look for investments that create private value and not social value, which is one explanation for the lack of VC funding in cleantech (Wustenhagen and Teppo, 2006). The study's findings further highlight another characteristic

as one of the main challenges for attracting co-investors - namely regulations and policies, and the uncertainty and risk it brings. This is in cohesion with the theory, which suggests that the high level of technological complexity of cleantech startups can make communication with investors more difficult (Erzurumlu et al., 2011). Even though some cases stated that these investments are often technically complex, they did not relate it to attracting co-investors. Overall, it seems evident that outreach is something Norwegian VC funds investing in cleantech should focus on as it is both important and particularly challenging in the cleantech context.

For the human resources utilized in outreach, the analysis showed that both bonding and bridging social capital can have a significant positive impact. Georgeson et al. (2014) states that networks enable co-investing, which is also found in this study. Several cases explained how they reached out to other VC funds for them to become co-investors, using their bonding social capital. Further, it was also described by some cases how they reached out to large industry incumbents, in order to get industry partners for their cleantech investments, utilizing their bridging social capital. Moreover, this bridging social capital was sometimes found to be the result of previous industrial experience, which adds to why industry specific human capital is also of particular importance.

From the findings and established literature, outreach seems to be a very central value adding activity when investing in cleantech. This is due to several of the elements which characterize cleantech, such as how social value can make gaining co-investors more difficult, but that the capital intensity of cleantech makes outreach in the form of securing additional financing even more important. Hence, bonding and bridging social capital is something VC funds investing in cleantech should focus on maintaining. Thus, the third proposition becomes:

*3) Outreach is of particular importance when investing in the cleantech sector*

*3 a) Bonding social capital is essential to gain co-investors*

*3 b) Bridging social capital is essential to gain industry partners*

### **The importance of recruiting activities and bridging social capital in a cleantech context**

Through the empirical findings and analysis, recruitment was found to be an especially important value adding activity. As earlier mentioned, all of the funds, except one are generalists. Thus, having the needed competence and experience within the cleantech startup becomes especially important as not all the funds have this themselves. Still, this is a value adding activity which seems to be rated as very important in general, and not only in particular for cleantech. In the existing literature on value added, both Large and Muegge (2008) and Gorman and Sahlman (1989) include recruiting activities as one of the most important ways of adding value, with particular focus on building the management team. In the cleantech literature, the study by Randjelovic et al. (2003) showed that generalist VC funds often decided not to invest in cleantech because of their lack of understanding of the specific technology and eco industry. This highlights the importance of recruiting the right people and attaining the needed competence, which coincides with recruitment being one of the most important value adding activities performed by the case companies, especially in the cleantech industry.

From Chapter 5 it became evident that bridging social capital is the most important human resource for conducting successful recruitment for cleantech investments. One fund decided to recruit from a very industry specific company to compensate for their own lack of industry specific human capital. Others mentioned how they did not see it as a problem that they themselves lacked relevant knowledge of the cleantech sector. They believed the real issue was obtaining the right competence through recruitment for the investment, not internal competence in the VC fund. The findings further showed that almost all cases used their network in recruiting, while one case explained how they used a recruitment bureau. Hence, overall it can be argued that network is beneficial for recruitment activities. This is also supported by theory, as Meglio et al. (2017) describe how access to needed capabilities can be facilitated by VC funds helping their investments through contacts in the VC fund's network.

An interesting notion arises by how the VC funds without relevant industry experience compensate for this lack of competence through recruitment for the cleantech venture, but that they seem to conduct these recruitment activities through an industry related network. This becomes a paradoxical situation due to the fact that some findings, and also existing literature suggests that building a network within an industry is closely connected to having experience within that industry yourself. One example is how Bottazzi et al. (2008) conclude that specific

human capital makes venture capitalists more likely to recruit new employees and secure new funding for their investments. Hence, it seems likely that successful recruitments require relevant industry experience and specific human capital, which was exactly what the VC funds were trying to compensate for in the first place. Still, it seems that many of the case companies in this thesis managed to execute successful recruiting activities without having much industry experience. Even if some of the funds mentioned that they struggled with recruiting the right niche competence for their cleantech investments, most funds said to have conducted successful recruitment activities. Thus, this is an example of where this study's findings show varying results, as well as opposing some of the existing literature. To recap, it may seem like there is a link between a VC fund's relevant industry experience and the quality of their bridging social capital, which makes industry specific human capital indirectly important in recruiting activities. Still the results are too inconclusive to make a definite affirmation. Thus, this topic will be given as a suggestion for further research.

Overall, the authors' findings coincide with the current literature in establishing recruitment as an essential value adding activity. For investing in cleantech, the fact that most Norwegian VC funds are generalists imply how they need to acquire the specific competence needed for each cleantech investment. Further, most cases highlighted using their network in recruiting for cleantech, again emphasizing bridging social capital as something VC funds investing in cleantech should focus on. However, a question up for debate is if the VC funds are able to acquire the needed bridging social capital without also having relevant industry experience. A fourth proposition then becomes:

*4) Recruiting activities are important when investing in the cleantech sector; most VC funds are generalists, and thus dependent on securing relevant knowledge and experience for their investments*

*4 a) Bridging social capital is essential in all recruiting activities*

*4 b) There is a link between a VC fund's relevant industry experience and their bridging social capital, thus making industry specific human capital indirectly important in recruiting activities*

### **The importance of strategizing activities, industry specific human capital and bridging social capital in the cleantech context**

From the analysis it becomes clear that strategizing activities are both important, as well as frequently undertaken by Norwegian VC funds. The most central aspects of strategizing in the cleantech sector turn out to be conducting market analyses, creating business concepts, as well as managing regulations and policies. Strategizing was found to be highly important in the cleantech sector due to uncertainty regarding conservative markets, generally demanding market conditions, policies and regulations. These characteristics describing the cleantech industry found in this study can be confirmed by existing literature. Criscuolo and Menon (2015) claim that policies are of great importance in the energy sector. Further the literature show that these policies can either act as a source of investment risk (Knight, 2012, Migendt et al., 2017), or help create valuable opportunities (Sun et al., 2010, Criscuolo and Menon, 2015). The literature also states that the market acceptance in cleantech is significantly slower than for other comparable sectors (Tierney, 2011, Hargadon, 2012). Additionally, the cleantech sector is viewed as very capital intensive (Wustenhagen and Teppo, 2006), as well as having longer technology lead times than other sectors (Gaddy et al., 2017). Thus, both the literature and the empirical findings agree that cleantech involves aspects such as market risk and policies, which underlines the importance of strategic value adding activities in a cleantech context.

According to the empirical data, industry specific human capital gives an important contribution to strategizing activities, as specific insight into cleantech characteristics can be a great advantage. The reason for this is that the cleantech characteristics found in this study, which also have been confirmed by the existing literature, have a direct impact on the way a market analysis should be conducted. The industry specific human capital helps the venture capitalist see through the cleantech market hype, determine the actual state of the market, and take action accordingly. Dimov and Shepherd (2005) support this by linking specific knowledge about an investment's environment to successful strategizing. One example showed how general human capital also proved to be useful, by the mentioned venture capitalist who explained how his background from politics let him concretize and predict the actual outcomes of policies and regulations in a more successful manner. Further, the empirical data show several examples of funds using their bridging network to pivot their investments into new markets or niches. Thus, showing that bridging social capital is very useful when conducting strategizing activities. Recent research has also shown that the

networks of venture capitalists influence their value adding capability (Maula et al., 2005), but say nothing in regard to strategizing activities in particular, making it difficult to confirm this connection beyond the findings in this empirical study. The fifth proposition is formulated as:

*5) Strategizing activities are considered important when investing in cleantech*

*5 a) Industry specific human capital gives an important contribution, as specific insight is key to succeed in the cleantech industry*

*5 b) Bridging social capital is very useful when locating alternative markets and creating new business concepts*

### **The importance of consulting activities and industry specific human capital in the cleantech context**

The analysis show that consulting activities are frequently undertaken by Norwegian VC funds. Further they are stated as important by several interviewees, as well as being of particular relevance in the cleantech context. According to the empirical findings, the lack of a VC fund's industry specific human capital often seems to result in the hiring of external industry expertise.

According to Cumming (2010), venture capitalists have a relative advantage compared to consultants when providing business advice to entrepreneurs. He further explains that this result is dependent on the relative efficiency of the efforts of the two agents, concluding that venture capitalists are superior on this issue. This stands in contrast to the findings in this paper, as the majority of the funds state to involve consultants when developing their cleantech investments. As mentioned, it seems like the funds with industry specific human capital valued it highly and believed it to be an advantage. They stated that this advantage was particularly high in the day-to-day work and cooperation. Still, the funds without much industry specific human capital, did not state it as a problem, as they considered themselves sufficiently able to acquire external expertise. Another interesting observation is how the venture capitalists with relevant industry experience, conducting consulting activities themselves, also seemed to be above average interested in re-investing in the cleantech sector, compared to those who used consultant advice. Overall, when combining the existing literature with the findings in this paper it seems like venture capitalists providing business advice to their investments is the best option when aiming for business development. Still, as

the results are somewhat inconclusive, it becomes difficult to make a finite conclusion on the topic. The sixth proposition becomes:

*6) Consulting activities are considered important when investing in cleantech*

*6 a) When lacking industry specific human capital, VC funds become dependent on the use of external consultancy agencies*

### **The role of mandating activities and human capital in the cleantech context**

The empirical data shows only some evidence of mandating activities being executed by Norwegian VC funds today. This data has further only come from direct questions on the topic, except for in one case study. Despite this, it has been mentioned that several of the funds believe that cleantech entrepreneurs can be too focused on the environmental and sustainability aspects of their company, thus pushing the startup in a different direction than what the VC fund would prefer. To mitigate this issue, mandating activities such as the ones mentioned in this study (milestone plans, bonus systems, share option systems) should be more in focus for Norwegian VC funds investing in cleantech than they are today.

When viewing the findings in light of existing literature, the advantage of mandating is highlighted further. Busenitz et al. (2004) refer to VC information as consisting of forms of influence such as incentives and penalties given by the VC fund to improve the performance of their investment. Further, Kaplan and Stromberg (2004) state that if there is a severe information problem between the VC fund and venture, the more contracts should be tied to performance. This could suggest that for this study's cases there have not been much information problems, seeing that none has mentioned contracts as being essential. Findings showed how forms of mandating mostly evolved around stock option schemes and bonus systems. Hellmann and Puri (2002) stated that a key professionalization event is the introduction of a stock option plan. Moreover, Mitter and Kraus (2011) mention that a way to encourage the entrepreneur to work towards performance targets and align the goals of the entrepreneur with the ones of the VC fund is to implement a staged financing scheme. Thus, confirming the importance of goal alignment between VC funds and their investments. When viewing the empirical findings in light of this, an efficient way of executing mandating activities seem to be a combination of adding value, as well as adapting the investment model to better provide incentives for goal alignment.

To successfully conduct these mandating activities, the analysis shows that it is important for venture capitalists to both have previous experience with the cleantech industry, as well as in venture capitalism in general. Industry specific human capital is used to design mandating schemes suited to fit the specific industry needs, and task specific human capital is useful for the implementation and execution of these schemes. Not much has been written on this specific topic in the literature on human capital and VC funds. However, Dimov and Shepherd (2005) mention that specific human capital lowers the risk of portfolio companies going bankrupt, confirming its general positive impact. Due to the lack of previous literature, it is not possible to either confirm, or deny the importance of industry and task specific human capital when conducting mandating activities beyond the findings in this empirical study. Thus, this topic is in need of further research. The seventh proposition becomes:

- 7) Mandating activities should be more in focus when investing in the cleantech sector,*
  - 7 a) Industry specific human capital should be used to design mandating schemes*
  - 7b) Task specific human capital should be used to execute mandating schemes*

## 7 Conclusion

The authors of this master thesis have explored how VC funds add value to their cleantech investments. More specifically, the authors have tried to fulfil the following purpose: *to identify how Norwegian VC funds add value to their cleantech investments, and which aspects of human and social capital they draw upon to conduct these value adding contributions.* The thesis adds to the limited amount of research investigating the value added by VC funds in a cleantech context, as well as contributing further by suggesting a range of propositions for further research into this combined field. The two-layered framework has facilitated for a complex analysis, resulting in insightful answers to the papers' research questions.

For RQ1, three ways of adding value were carried out by all five cases of Norwegian VC funds and four were found to be of extra importance. Outreach to gain co-investors and industry partners seemed widely used for both obtaining additional financing and relevant competence. Further, while the literature shows that recruitment is one of the most essential value adding inputs in general, this study has shown that it is especially important for Norwegian VC funds investing in cleantech, as most lack relevant industry competence themselves. Strategizing activities were performed to develop business concepts and direct the cleantech investments towards other markets when needed. This is of particular importance as cleantech involves more uncertainty, both in terms of market risk, technology risk, and political risk. Hence, being able to outline new strategic directions for unforeseen events could prove to be crucial for the survival of cleantech investments. Lastly, consulting activities provided structured insight and expertise, mostly through hiring external resources, on essential factors such as the cleantech investment's market and competition.

When looking into RQ2, the empirical data showed that very few of the venture capitalists brought relevant industry specific human capital into the work of developing their cleantech ventures. This is an important finding as it becomes a contrast to how this resource seem to be especially central and important for adding value to cleantech investments. Further, almost all funds stated to use both bridging and bonding social capital. The last two categories, general and task specific human capital were stated to be utilized by only a few of the case companies, which the authors argue could be because they have a more subconscious contribution. Compared to the other resources, these were relatively less utilized in a direct manner.

When answering RQ3, the findings made it evident that cleantech comes with certain characteristics that are useful to take into consideration when deciding which value adding inputs to focus on. Thus, this study has shown how some of the challenges of cleantech can easier be overcome by certain actions carried out by the venture capitalists. Outreach to co-investors is of particular importance to overcome the challenge of capital intensity and reducing the high risk related to regulations and market uncertainty, with the analysis showing the need for utilizing both bridging and bonding social capital to achieve this. Recruitment was found to be crucial for the case companies in order to mitigate their lack of industry specific human capital and relying on beneficial social connections. Strategizing also proved to be important in the cleantech context, as it is characterized by several aspects of risk which makes the ability to adapt quickly to changes crucial for survival. To understand the underlying mechanisms of the cleantech sector and contribute to successful strategizing, the funds seem to be dependent on their industry specific human capital, specifically. Additionally, consulting activities were also deemed essential, and it was observed that funds lacking industry specific human capital typically hired external consultants to conduct these types of activities. Lastly, it was identified that mandating, although not focused on by Norwegian VC funds today, could have a significant contribution for the development of cleantech startups, and that this activity is particularly dependent on human capital to be conducted efficiently.

## 8 Implications and further research

This master thesis has investigated the value added by Norwegian VC funds to their cleantech investments, in general as well as through human and social capital. Following, implications for VC funds, cleantech startups, researchers, policy makers, and society will be presented. Lastly, suitable topics for further research into the field of VC funds and cleantech are suggested.

Some of the findings in this paper have practical implications, first and foremost for VC funds investing in cleantech. From the findings in this thesis, VC funds can get insight into which value adding activities and inputs they need to particularly focus on when investing in cleantech. This way they will be able to provide value added in a more successful way, creating development in their cleantech investments, and thus performing better over time. VC funds will also get information on which aspects of human and social capital they should develop to achieve better results in the cleantech sector. By discovering which resources the funds should focus on, the strategy processes, recruitment and continuing education of the funds will also be impacted. Additionally, there are some implications for cleantech startups, as the findings reveal which abilities they should look for in a VC fund, to make sure that they are going to receive the best value added possible.

Further, the findings have practical applications for researchers, policymakers and society as a whole. The results have implications for researchers, as they have covered a gap in the literature on VC funds and cleantech, when it comes to value added, human, and social capital. Further, the thesis has contributed to the general VC literature by adding to the limited amount of context specific research, by focusing on cleantech and Norwegian VC funds specifically. As a result, researchers will have a stronger foundation for expanding both mentioned fields of study in the future. Moreover, the research gives new insight into the challenges faced by Norwegian VC funds, which will give policymakers a better foundation for designing regulations and policies to create growth in the cleantech sector. Overall, it has become evident that VC funds' main focus is achieving a monetary reward, thus they do not feel especially inclined to invest in cleantech based on the environmental aspects. As such, and in correspondence with the suggestion from one of the venture capitalists, there might be a need for matching capital or other solutions from the government in order to increase the attractiveness of investing in cleantech. Finally, the paper could have long term implications

for society as a whole. If VC funds become more successful in cleantech, this will hopefully create a boost in the cleantech sector, and in the long run, support the sustainability transformation of a range of industries. This in turn will hopefully help mitigate the world's sustainability issues, resulting in a cleaner environment, slowing down the temperature increase across the globe, and support a more sustainable use of our natural resources.

When it comes to suggestions for further research, it would be interesting to look into to which extent specialized VC fund would be more successful than a generalist fund when investing in cleantech, seeing how the VC fund's industry specific human capital was found to be of particular significance. This could be done by comparing the performance of generalist VC funds with that of "green" VC funds. Since no such pure cleantech funds exist in Norway at the moment, the study would have to expand to investigating Scandinavian VC funds as well. Another suggestion for further research is to further examine the impact industry specific human capital has on a VC fund's recruitment process in a cleantech context. This is due to the fact that some results as well as existing literature point towards industry specific human capital being crucial for both building an industry network as well as for conducting recruiting activities. Still, most funds describe recruitment conducted through bridging social capital without actually having industry specific human capital. Thus, looking specifically at how VC funds, both with and without industry specific human capital, conduct recruitment for their cleantech investments could be an interesting undertaking. Additionally, because this paper is written only from the viewpoint of the VC fund, it would be equally interesting to address the research questions from the startup's perspective. This could provide another useful perspective on the topic, especially when it comes to value adding categories such as legitimation, which best can be documented from the startup's perspective. A final suggestion for further research is looking into the aspect of social value, which is uniquely connected to cleantech and separates it from other "high-tech" sectors. It would be interesting to further examine how this challenge can be met, and how one can attach some sort of financial value to these positive externalities. Researchers within the field of VC and cleantech are further urged to utilize this study as basis for identifying additional scientific areas that deserve further attention.

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